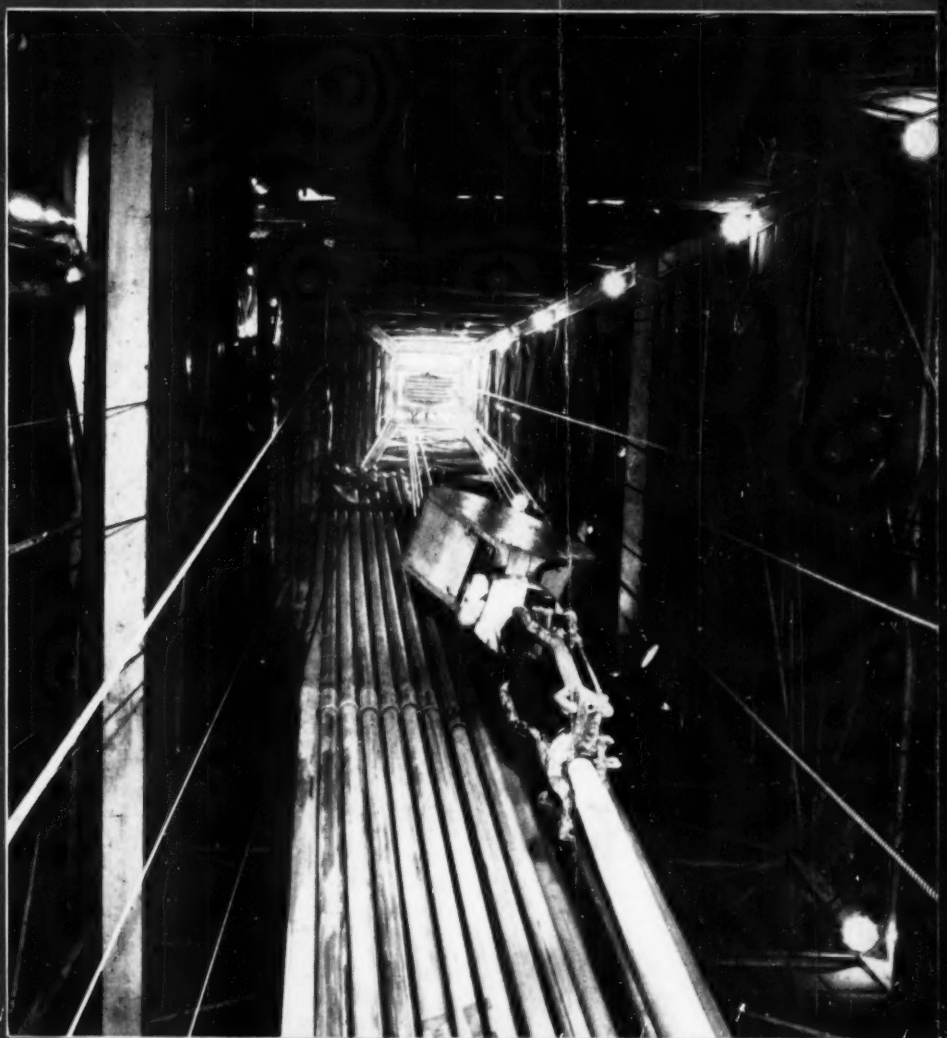
Diesel Power

& Diesel Transportation



Featuring:

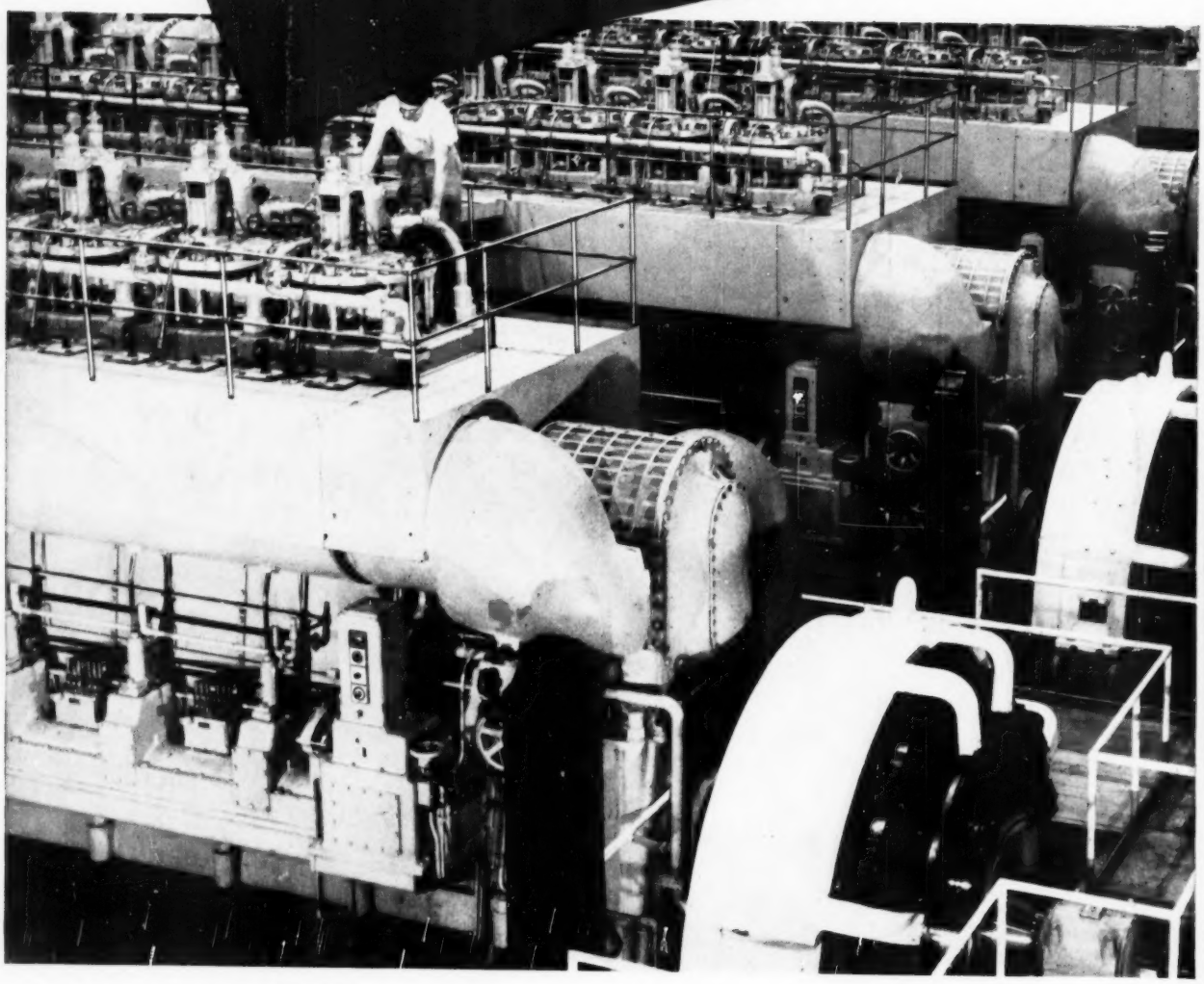
Preparation and Burning of Crude, Residual and Gaseous Fuels

The Steel Industry Needs Scrap— *Keep it Moving*

Our 29th Year

NOVEMBER, 1951

YOU CAN REDUCE
fuel consumption



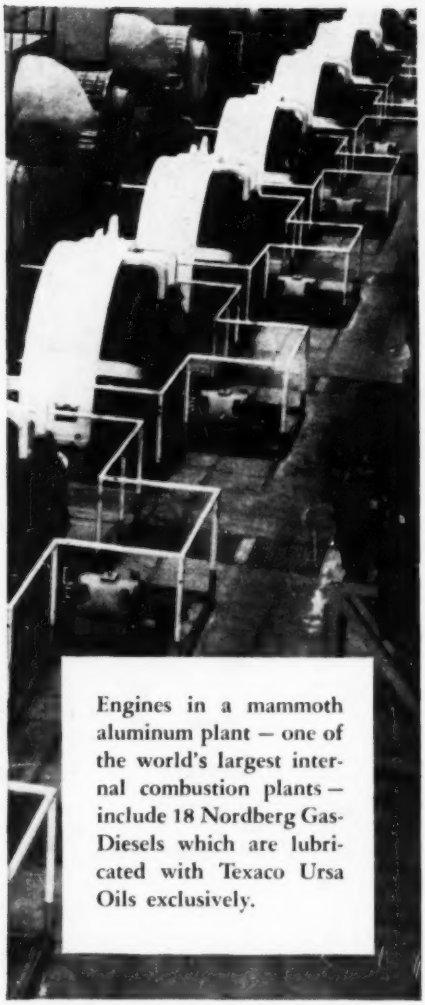
TUNE IN . . .
TEXACO STAR THEATER
starring
MILTON BERLE
on television
every Tuesday night.
See newspaper for
time and station.

TEXACO

TEXACO

DIESEL POWER and DIESEL TRANSPORTATION for November, 1951, Vol. XXIX, No. 11. It is published monthly by Diesel Publications, Inc., Orange, Conn. Executive and Editorial offices at 192 Lexington Ave., New York 16, N. Y. Subscription rates: United States, $3.00 per year, single copies 35¢; Canada $4.00; Foreign $5.00 per year. Entered as second class matter April 29, 1949 at the Post Office, Orange, Connecticut under Act of March 3, 1879.

YOU CAN REDUCE maintenance costs



Engines in a mammoth aluminum plant — one of the world's largest internal combustion plants — include 18 Nordberg Gas-Diesels which are lubricated with Texaco Ursa Oils exclusively.

. . . by lubricating with TEXACO URSA OIL

Diesel, gas or dual-fuel engines — all run better and cleaner when the lubricant is *Texaco Ursa Oil*. This is the oil with *extra* resistance to oxidation . . . *extra* ability to keep rings free, ports clear, valve action snappy. You can be sure of proper compression and combustion . . . lower fuel consumption.

Maintenance costs are lower, too, because *Texaco Ursa Oil* wards off wear with a tough, friction-fighting film that stands up through the severest kind of service. All moving parts last longer.

There is a complete line of Texaco Diesel lubricating oils — a viscosity to meet every operating condition. They are approved by leading engine builders and preferred by operators everywhere. In fact —

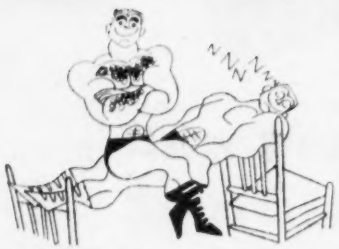
More stationary Diesel h.p. and more railroad Diesel locomotives in the U. S. are lubricated with Texaco than with any other brand.

A Texaco Lubrication Engineer will gladly show you how effective lubrication can step up Diesel efficiency and economy in your plant. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

CYCLAN

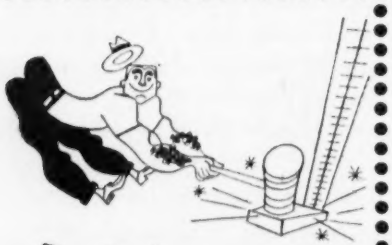
The new Piston Ring material for tough service in heavy duty Diesel and Gas Engines



1 *Cyclan* IS TOUGH, WITH PLENTY OF TENSION, BUT NOT BRITTLE

2 *Cyclan* HAS TWICE THE BREAKAGE RESISTANCE OF ORDINARY IRON

3 *Cyclan* RETAINS ORIGINAL TENSION UP TO 700° F.



4 *Cyclan* WITHSTANDS IMPACT, HAMMERING, AND FLEXING

5 *Cyclan* WITHSTANDS CONSIDERABLE DISTORTION WITHOUT LOSING SHAPE

6 *Cyclan* RESISTS WEAR FAR BETTER THAN STANDARD RING IRON

AVAILABLE FOR RINGS UP TO 9" DIAMETER.

Write for complete information

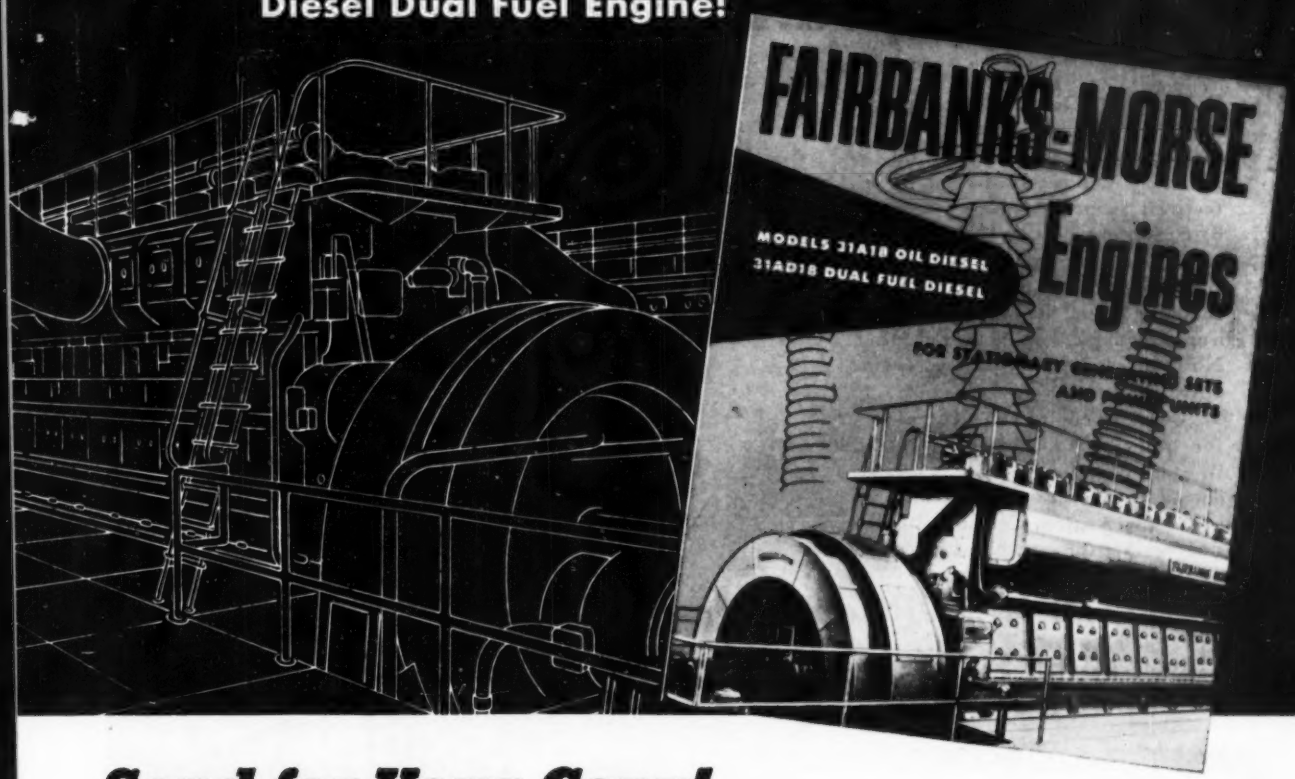
SEALED POWER CORPORATION
MUSKEGON, MICHIGAN

Sealed Power

PISTON RINGS · PISTONS
CYLINDER SLEEVES

NEW BULLETIN

Describes Newest BIG Fairbanks-Morse Diesel Dual Fuel Engine!



Send for Your Copy!

Here is complete, up-to-date and authoritative information on the newest Diesel Dual Fuel engines in the 3500 hp. class! A valuable reference, it covers the advanced design features you'll find in the new Fairbanks-Morse Model 31A18 Oil Diesel and Dual Fuel engines. With cross-sections and descriptive diagrams, it covers in detail the design and operation of these heavy duty engines, including complete descriptions of Dual Fuel operations—showing how the Model 31A18 Oil Diesel engine may be economically changed to a Dual Fuel engine by merely installing simple accessory equipment. Power station owners and operators interested in low operating and maintenance cost, automatic safety control, simplicity of design and operation—and complete dependability with high efficiency—should have this book for their files. Use the coupon to get your copy.

FAIRBANKS-MORSE,

a name worth remembering

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • ELECTRICAL MACHINERY • PUMPS • SCALES • RAIL CARS • MAGNETOS • FARM MACHINERY

TO LEARN MORE ABOUT THESE MODEL 31A18 FEATURES...

En bloc construction ... for greater rigidity and correct alignment ...

Removable cylinder liners ... with integrally cast leakproof waterjacket ...

Dome-shaped cylinder heads ... for improved combustion and cooling ...

Improved connecting rod design ... pistons and rods may be removed without disturbing crankpin bearings ...

Oil-cooled pistons ... for longer piston ring and liner life ...

Simple controls ... start or stop by the movement of a single lever. Hydraulic governor speed control ...

Use this Coupon!

Fairbanks, Morse & Co.,
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Send me a copy of the new bulletin on the Model 31A18 Oil Diesel and Dual Fuel engine.

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For quiet Power Plant operation

specify Burgess-Manning Snubbers

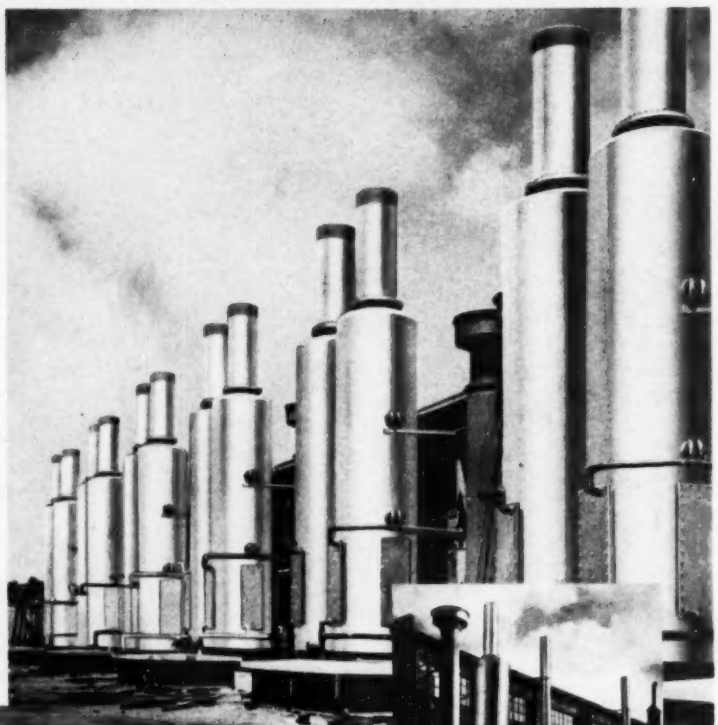
to eliminate engine exhaust noise

● Wherever Diesel-electric power plants are located . . . whether engines are large or small . . . reliable Burgess-Manning Snubbers are ideal for effectively reducing the annoying roar of engine exhausts to the noise-level of the surrounding area. By snubbing the exhaust "slugs" through successive snubbing stages, the gas is smoothed to a unidirectional flow. Noise is reduced. No interference with efficient engine operation.

To reduce engine exhaust noise . . . for quiet surroundings . . . install Burgess-Manning Snubbers—guaranteed performance backed by a reliable organization. Consult with the Burgess-Manning engineers, today.

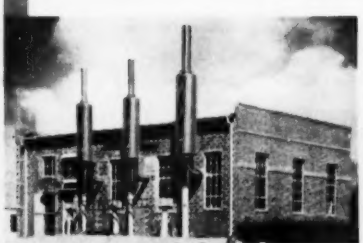
BURGESS-MANNING COMPANY

LIBERTYVILLE, ILLINOIS



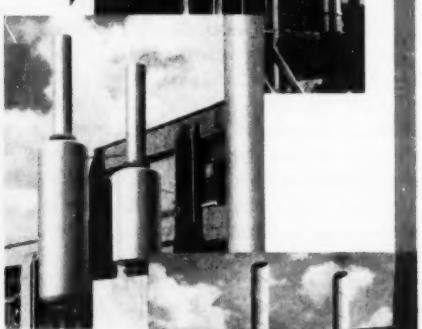
MEXICO — Nordberg Diesels equipped with Snubbers

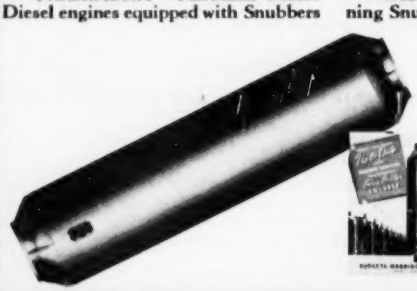
MICHIGAN — Nordberg Diesels equipped with Snubbers



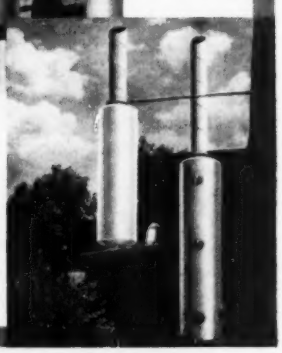
NEBRASKA — Fairbanks-Morse Diesel engines equipped with Snubbers

WISCONSIN — Three Burgess-Manning Snubbers on Worthington Diesels





OHIO — Municipal light plant equipped with Exhaust Snubbers

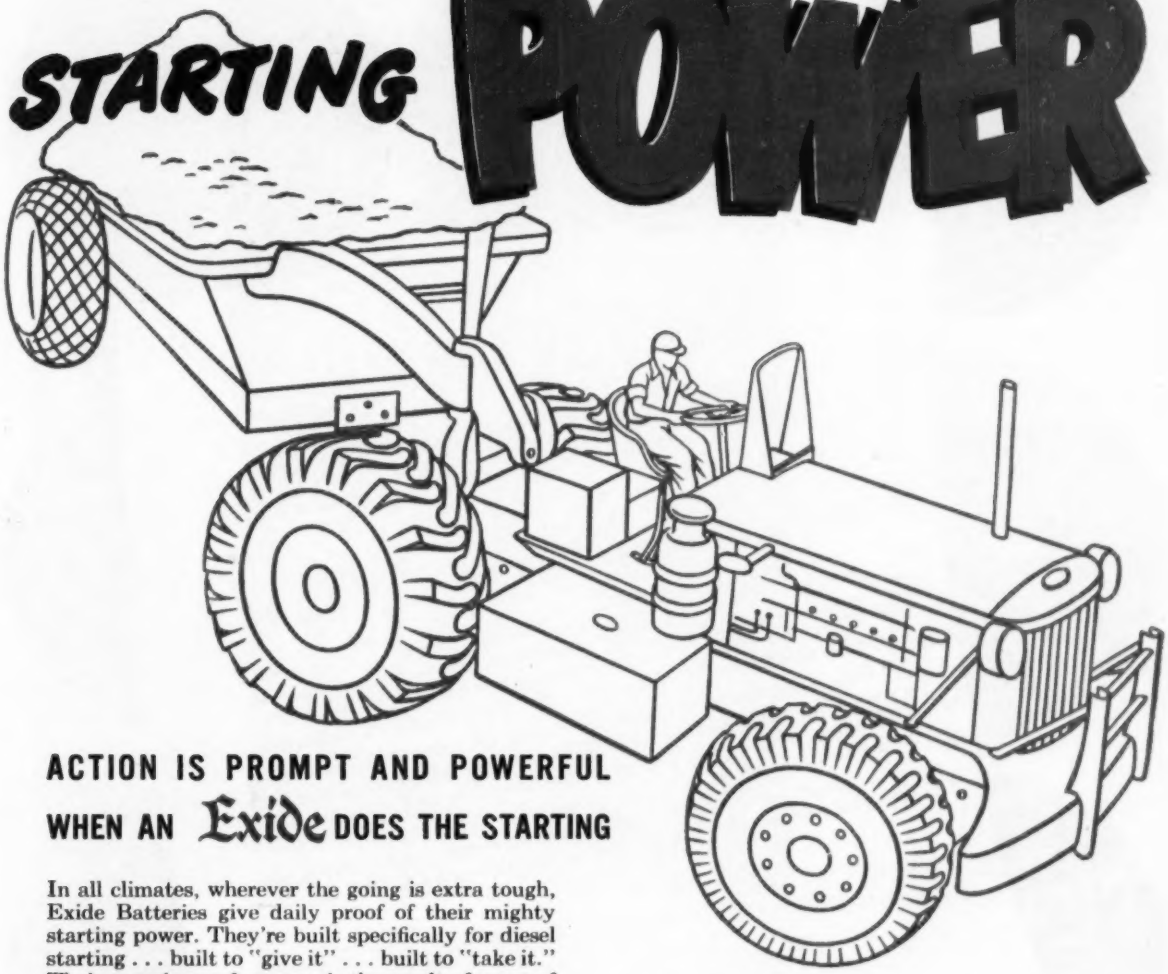


WRITE FOR BULLETIN

"Bring Your Plant Up to Date With Burgess-Manning Heavy-Duty Slug Buster Snubber."

MICHIGAN — Diesel Electric Power Plant equipped with Snubbers on Fairbanks-Morse engines

STARTING POWER



ACTION IS PROMPT AND POWERFUL WHEN AN Exide DOES THE STARTING

In all climates, wherever the going is extra tough, Exide Batteries give daily proof of their mighty starting power. They're built specifically for diesel starting . . . built to "give it" . . . built to "take it." Their superior performance is the result of years of research-engineering, plus continuous testing under all service conditions. The object: to give you a battery that's outstanding for all heavy-duty starting jobs. In Exide diesel-starting batteries you get:

QUICK BREAKAWAY and fast acceleration of engine to firing speed.

LOW DEPRECIATION due to their extra long life.

LOW COSTS of operation and maintenance.

RUGGED CONSTRUCTION for rough usage in hard service.

Use Exide Diesel Starting Batteries for all heavy-duty service—in buses, trucks, tractors, off-the-highway equipment, ships, power plants, diesel-electric locomotives.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

"Exide" Reg. Trade-mark U.S. Pat. Off.

WHEN IT'S AN EXIDE YOUR DIESELS START

1888 . . . DEPENDABLE BATTERIES FOR 63 YEARS . . . 1951

SAVE WEAR AND FUEL— KEEP YOUR DIESELS CLEAN!

Are your diesels as CLEAN as they might be — completely free from sticking rings, blow-by, sluggish valve action, and accumulated deposits? It pays dividends in less maintenance cost and lowered fuel bills to make doubly sure the oil you use is actually keeping your diesels clean.

Many operators have found that Sinclair GASCON Oils clean engines while they lubricate. GASCON Oils help stop sludge and varnish from forming, keep valves, pistons, rings, and other vital parts free from deposits and gums.

For "tough" service—continuous top loading, frequent idling, high jacket and oil temperatures, use heavy-duty, additive-type GASCON Oils HD.

SINCLAIR DIESEL OILS

keep engines Clean

For lubrication counsel, see your nearest Supplier of Sinclair Products or write direct to Sinclair Refining Company, 600 Fifth Avenue, New York 20, N. Y.

You Can Clean This Fluid Strainer Without Stopping the Flow

Cuno AUTO-KLEAN is the *only* fluid strainer with "comb-action cleaning" which permits it to work uninterruptedly. Dirt accumulations are dislodged *while* the straining goes on. This can be done automatically. *Guaranteed* to remove 100% of all solids larger than specified.

CUNO

Fluid Conditioning

Removes More Sizes of Solids from More Kinds of Fluids

Strain fuels, lubricants, process fluids, etc.—AUTO-KLEAN
Filter fuels, lubricants, process fluids, etc.—MICRO-KLEAN
Clean raw water, recirculating water, etc.—FLO-KLEAN

No Risks With Discs

The all-metal disc element in Cuno AUTO-KLEAN positively cleans lube and fuel oil of all solids larger than specified.*

This compact strainer handles full flow in minimum space. When the strainer itself needs cleaning, you don't have to stop the engine.

When the disc element is rotated—manually or automatically—cleaner blades "comb out" all accumulations between the discs, no matter how sticky or deeply embedded.

The Indestructible Strainer

This "comb-action" type of cleaning is much more thorough than mere surface-scraping. It restores full initial capacity and free area. And there's no danger of pushing dirt through the strainer into the discharge flow.

The discs are permanent, non-collapsible, unbreakable. No chance of an unsuspected gap or channel to occur, permitting passage of harmful solids. And—nothing to wear out and need replacing.

Cuno AUTO-KLEAN Strainers are available for built-in or external installation. Continuously cleanable feature permits single unit installation. Straight-line connections for simplicity of installation on either fuel or lube.

*Models available for straining from .0036 to .012 in.

Cuno Engineering Corporation
Dept. 255C, South Vine Street, Meriden, Conn.

Please send information on Cuno AUTO-KLEAN Strainer for Diesel protection.

Name.....

Company.....

Address.....

City.....Zone....State.....

Please attach to business letterhead

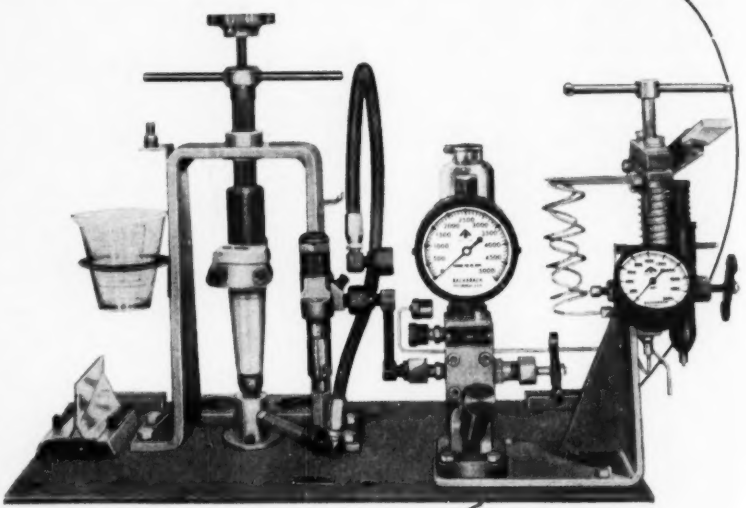
THE MOST COMPLETE LINE of Diesel Nozzle Testing Equipment EVER OFFERED!

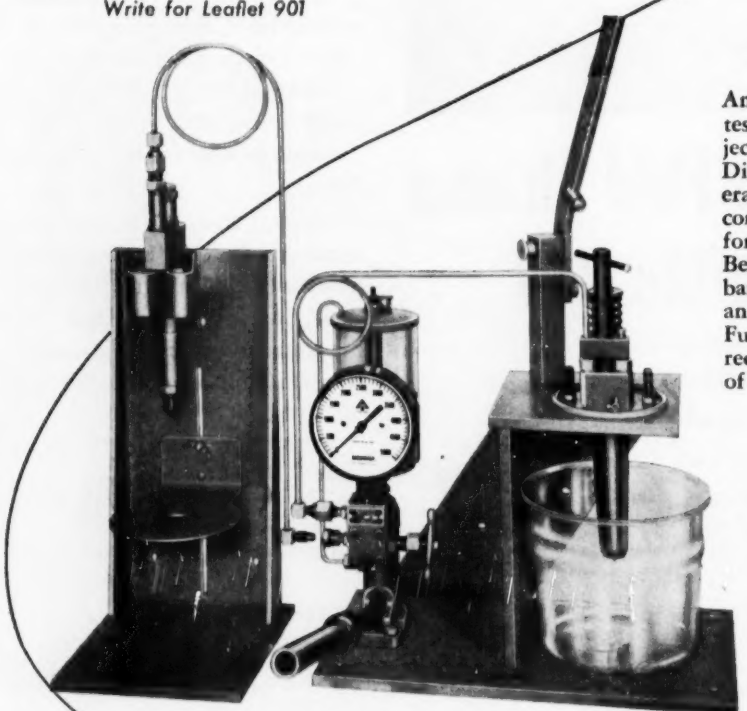
For AUTOMOTIVE DIESELS

A completely self-contained, easy-to-use and compact test set for checking nozzles and injectors of all Diesels up to 60 hp per cylinder. The heart of this test set is the Bacharach Nozzle Test Pump located in the center. Nozzles made by American Bosch, Bendix, Caterpillar, International Harvester, etc. are attached directly to test pump by means of steel tube and union nuts. Cummins injectors are held in test fixture at left; GM 71 injectors in test fixture at right. These fixtures have individual fuel pressure lines which may be interchangeably connected to test pump.

Test Set includes Connector Set 44 comprising connector tube, Ermeto adapter and fuel inlet connecting nuts for all American Bosch R, S and T size nozzles and similar size nozzles of other makes.

Write for Leaflet 901





For HEAVY DUTY DIESELS

An exceptionally versatile and convenient test set for checking nozzles and unit injectors of medium and large bore and stroke Diesel engines for marine, railroad and general industrial applications. Test set comes complete with fuel inlet connection fittings for American Bosch T, U and V size nozzles, Bendix-Scintilla C and D size nozzles, Fairbanks, Morse nozzles for 38D8-⅛ engines, and Electro-Motive 567 and 278A injectors. Fuel inlet connections to suit other specific requirements furnished promptly on receipt of specifications.

Write for Bulletin 634

This equipment is available in the two complete test sets illustrated, or may be purchased selectively in group assemblies for testing a particular type or related group of nozzles or injectors.

BACHARACH INDUSTRIAL INSTRUMENT COMPANY
7000 BENNETT STREET • PITTSBURGH 8, PA.

Cummins® Diesels do so many jobs-so much better

Shovels, cranes, industrial locomotives

Drilling rigs, centrifugal pumps, generator sets

Buses and on-highway trucks

...because they're custom-built to fit the job

Earthmovers, logging yarders and loaders

Off-highway trucks, crawler tractors

Work boats, pleasure craft

Lightweight, high-speed Diesels (50-550 hp) for these and many other uses

---

...because they're

BUILT NOT ONCE BUT TWICE

Rugged, lightweight, high-speed Cummins Diesels are at work everywhere. Each engine is built *twice*. It's assembled, run-in tested, disassembled and inspected, then reassembled and tested again. This extra care in building, plus Cummins exclusive fuel system and an efficient and expanding service and parts organization, means minimum "down time", more power and profits for the user. See your Cummins dealer.

CUMMINS Dependable DIESEL

TRADEMARK REG. U. S. PAT. OFF.

Diesel power by CUMMINS

CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA

Export: Cummins Diesel Export Corporation • Columbus, Indiana, U.S.A. • Cable: Cumdiex

Exhaustive ENGINE TESTS Prove

ALL 5 CLRC TESTS, standardized by the Co-ordinating Lubricants Research Committee, prove Shell Rotella Oil superior to the average of leading diesel lubricants . . . from every critical standpoint: parts-wear, corrosion resistance, ring-sticking and piston fouling.

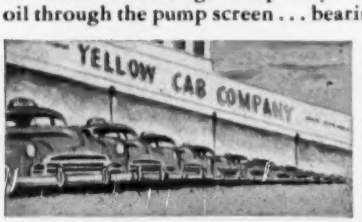
Moreover, further tests, such as the Modified Lauson Lacquer Rating Test and Shell's own extremely severe Four Ball Test . . . all add proof upon proof that Shell Rotella Oil *does* keep engines clean longer . . . *does* extend time between overhauls . . . *does* reduce parts wear.

FLEET SERVICE confirms engine test results!

Read these authorized reports:

Effect of Oil on Valve Burning

Yellow Cab Company, Nashville, Tenn., has 75 cabs, running 24 hours daily. They write: "We have always had trouble with sludge forming in the crankcase of our motors due to the constant start and stop driving . . . On some cabs this sludge completely blocked the passage of oil through the pump screen . . . bearings were burned out.



"After months of operation on Shell Rotella Oil we are glad to report that the *motors (thus far) examined have been found entirely clean, the pump screen as bright as brand new, and we have had no bearing trouble of any nature.*"

Creston Transfer Company, Grand Rapids, Michigan, haul uncrated furniture to the East Coast and southern cities. Creston began using Shell Rotella Oil nearly 4 years ago to correct a serious overhaul problem due to short valve life in their trailer truck engines. Shell Rotella Oil has increased valve life from 8,000 miles to better than 40,000 miles and greatly reduced all-around maintenance costs. Creston Transfer is now expanding with hauls to nearly every state. The proved lower maintenance through using Shell Rotella Oil is a basic part of Creston's expansion planning.

These are Chevy trucks

SHELL ROTELLA OIL . . . EXTENDS

You can EXTEND TIME between overhauls...

SHELL ROTELLA OIL slashes maintenance costs—Maintains engine efficiency

1. Positive ANTI-ACID ACTION

Shell Rotella Oil drastically reduces wear in the vital top-cylinder zone by counteracting the acid action of unburned fuel particles. This protection is extremely important in engines with intermittent loading.

2. Constant DISPERSANT ACTION

The excellent dispersant properties of Shell Rotella Oil permit it to dissolve contaminants and hold them in suspension until draining time. This prevents premature fouling.

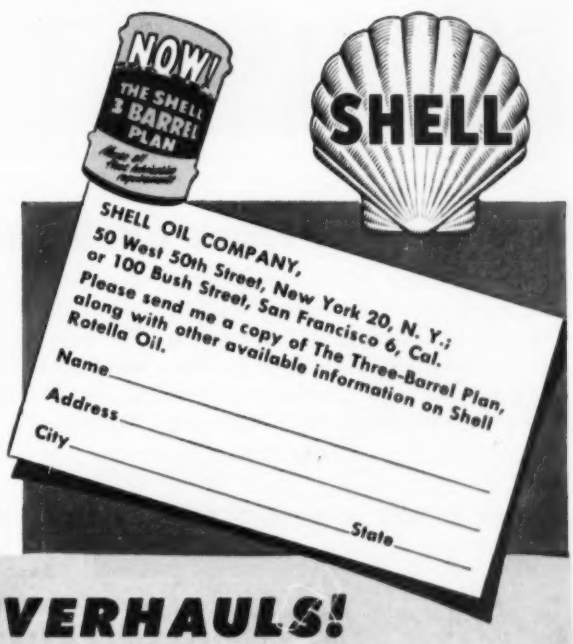
3. Maintained Engine Efficiency

Is the direct result of reduced top-cylinder and ring-face wear. Moreover, new or reconditioned engines operating with Shell Rotella Oil show a welcome extension of the "low oil consumption" period because of this same reduced wear. The above gains, combined with freedom from fouling and a significant increase in valve life, enable you to extend time between engine overhauls.

FLEET OPERATORS!

Shell Rotella Oil is "Barrel One" in Shell's famous Three-Barrel Plan for fleet lubrication

If you want to cut lubricant inventories to the bone . . . to realize savings in time, labor and materials . . . mail this coupon for "The Three-Barrel Plan." It's a practical booklet that shows how this revolutionary lubrication program can cut your maintenance costs.


NOW!
THE SHELL 3 BARREL PLAN
SHELL
SHELL OIL COMPANY,
50 West 50th Street, New York 20, N. Y.;
or 100 Bush Street, San Francisco 6, Cal.
Please send me a copy of The Three-Barrel Plan, along with other available information on Shell Rotella Oil.
Name
Address
City
State

TIME BETWEEN OVERHAULS!

American **Flexible** Metal Hose

for exhaust and air intake

Absorbs Vibration
American Flexible Metal Hose effectively absorbs engine and exhaust vibration which would otherwise be transmitted along the line.
Simplifies Offsets
The flexibility of American Metal Hose cuts installation time and effort. It's especially adapted to offset connections where it can be bent to take care of misaligned parts.
Eliminates Expansion Stresses
Severe thermal expansion and contraction stresses are taken in stride by American Flexible Metal Hose. This self-adjusting flexible hose moves with such disturbances, keeps them within its own length and thus prevents shearing of flange bolts, etc.

two general types available

American Flexible Metal Hose for exhaust or air intake—marine or industrial diesels — is available in two general types: Corrugated Steel, Type B, illustrated at left; and Interlocked Steel, shown at extreme right. Flanges are available to ASA standards or various navy specifications. For details, write The American Brass Company, American Metal Hose Branch, Waterbury 20, Conn. In Canada: The Canadian Fairbanks-Morse Company, Ltd. 51254

Other Products For Diesel Use

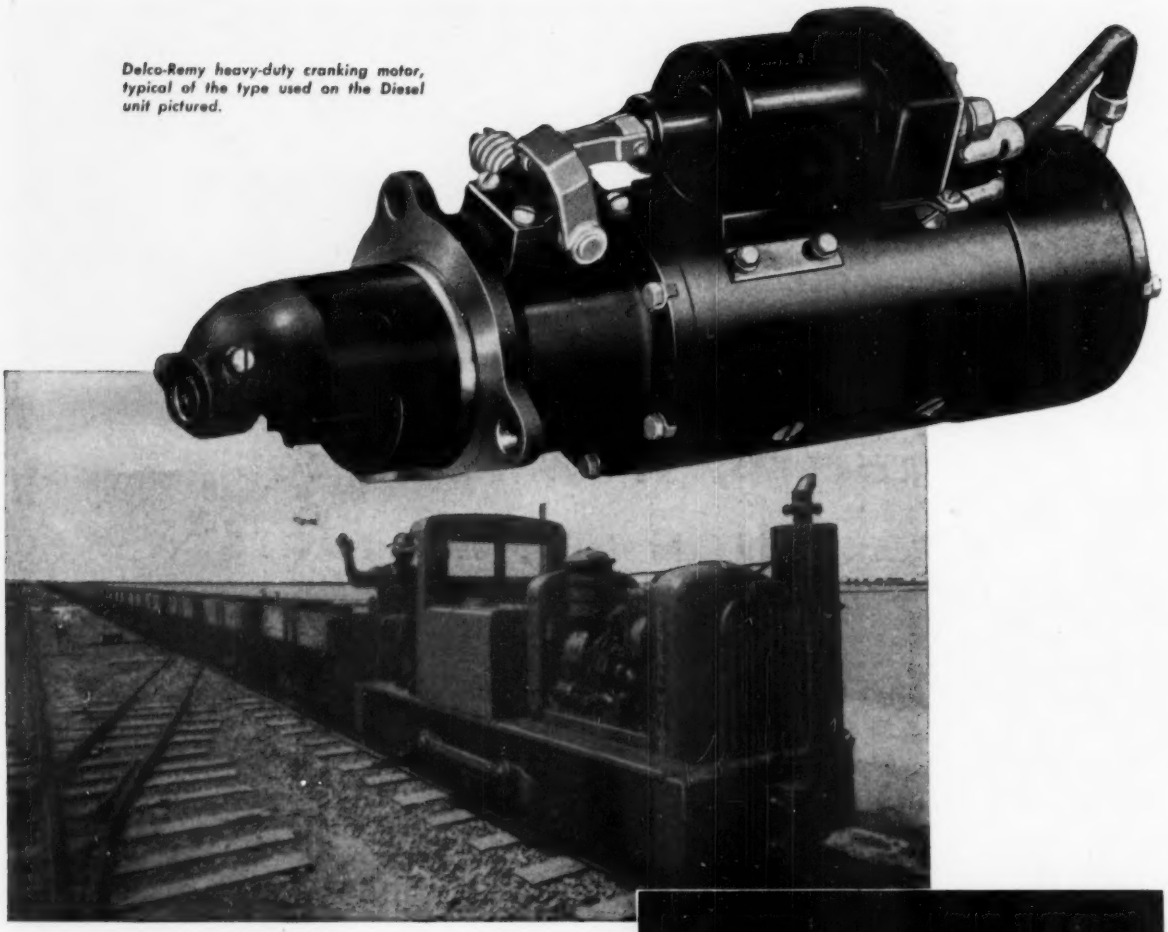
Flexible tubing with wire braid covering for: starting air, circulating water, fuel oil, lubricating oil. Tubing available in bronze or carbon steel. Assemblies complete with fittings.

wherever connectors must move...

ANACONDA

American **FLEXIBLE METAL HOSE AND TUBING**

SLEEVE BEARINGS
•
CAST BRONZE BUSHINGS
•
ROLLED, SPLIT BUSHINGS
•
PRECISION BRONZE PARTS
•
WASHERS
•
SPACER TUBES
We specialize in the production of sleeve bearings and parts with bearing properties.
Within our six-plant manufacturing organization, our products range from simple spacer tubes to big, precision bearings weighing hundreds of pounds each. We work with babbitt, copper-lead, bronze, steel, brass, aluminum or silver—in standard or special alloys to meet exact specifications.
All production rigidly quality-controlled. Research and engineering facilities available without obligation. FEDERAL-MOGUL CORPORATION, 11041 Shoemaker, DETROIT 13, MICHIGAN
Since 1899
FEDERAL-MOGUL



Delco-Remy heavy-duty cranking motor, typical of the type used on the Diesel unit pictured.

SERVING THE DIESELS THAT SERVE AMERICA . . .

There is scarcely an industry that is not motorized—successfully—with Delco-Remy-equipped Diesel engines.

In the California salt fields, for instance, salt cars are commonly Diesel-hauled between evaporation ponds and processing plants.

Diesels and Delco-Remy have been "keeping company" since the earliest Diesels were built . . . an unbeatable combination where dependable operation must be accomplished.

DELCO-REMY

ELECTRICAL EQUIPMENT

UNITED SERVICE MOTORS

DELCO-REMY—A UNITED MOTORS LINE
Service Parts and Delco Batteries Available Everywhere Through UNITED MOTORS DISTRIBUTORS

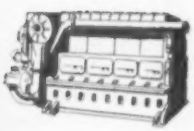
Delco-Remy

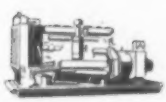
DIVISION, GENERAL MOTORS CORPORATION
ANDERSON, INDIANA

DELCO-REMY • WHEREVER WHEELS TURN OR PROPELLERS SPIN

Diesel Engine Staying Power

Upped





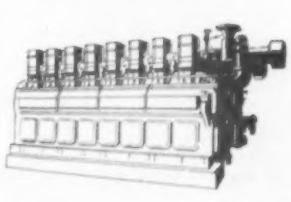
BY THESE 4 STEPS

1st step: Examine Cities Service lubricants for out-and-out quality through your purchasing experts or test facilities . . . or from service records established by critical users.

2nd step: Look into the completeness of the Cities Service line as an aid to simplified ordering and prompt, steady supply . . . backed by the extensive facilities and intensive cooperation to keep you out of any lubrication "jam."

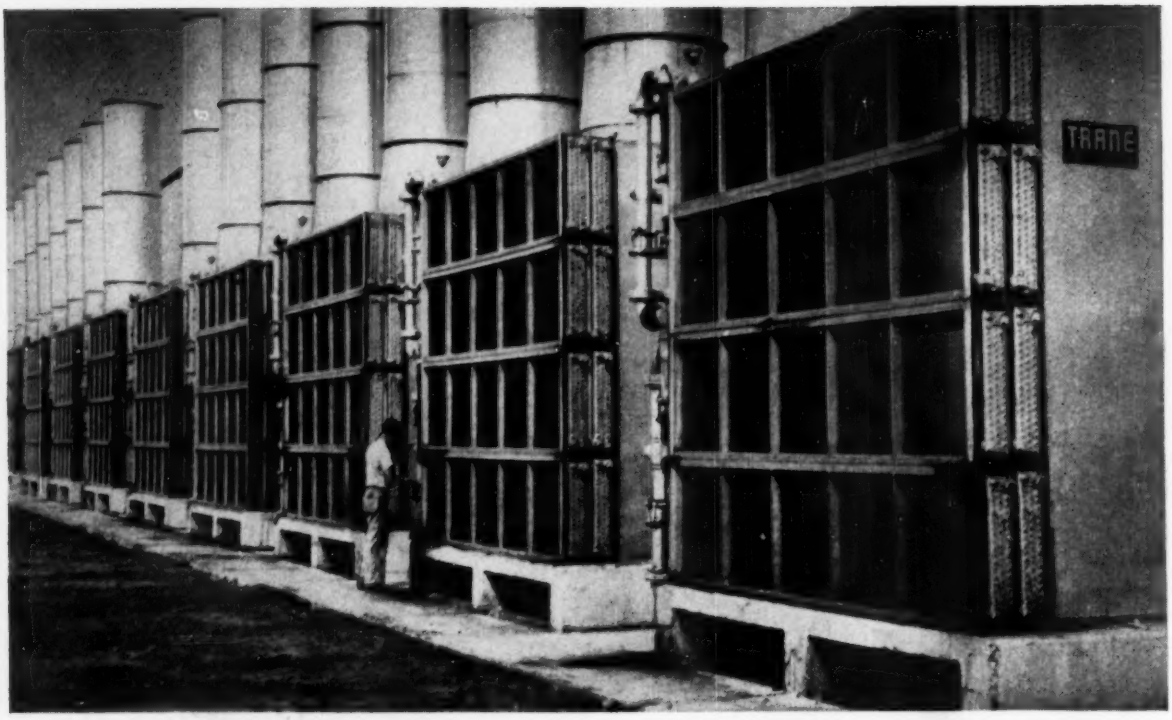
3rd step: Review today's most effective Diesel lubrication practices by consulting that fully informed specialist, the Cities Service Lubrication Engineer.

4th step: Ask for facts about the high character of the Cities Service line and the practical technical assistance now upping Diesel staying power for many of industry's "hardest drivers." Phone or write CITIES SERVICE OIL COMPANY, Room 196, Sixty Wall Tower, New York City 5.



CITIES SERVICE

QUALITY PETROLEUM PRODUCTS



74 More Engine Coolers for Alcoa

For more efficient engine cooling, for more aluminum production, the Aluminum Company of America has again called on Trane Dry Type Fluid Coolers. Now *almost 200* of these units will cool lube oil and jacket water of the big radial engines at Alcoa's reduction plant in Texas.

Almost 200 giant Trane Fluid Coolers will provide complete engine cooling efficiency without using water and requiring only a minimum of power!

These units can cut gas or diesel engine cooling costs to the quick. With flat plate-type fins and round tubes, the core of the unit offers less resistance to the air flow, so the unit needs less horsepower to do its cooling job. Heat transfer is faster and more efficient, too. That's because the fins are mechanically (and permanently) bonded to the tubes, and because the fin collars form a continuous sheath around the tubes.

A wide variety of standard core headerings are available, so the Trane Fluid Cooler can provide just the circulation and heat transfer rate desired.

There's no water to treat or sediment to remove with Trane dry type fluid cooling. Core headers and tubes are easy to reach and clean, and the fan motor is conveniently placed.

Ruggedly built, these units can take the strains and shocks of mobile and outdoor installations without extra bracing.

The units are available in horizontal air stream models, in 14 sizes with fan diameters of 18" to 120" and vertical air flow models in 8 sizes with fan diameters from 72" to 144". Trane Fluid Coolers have steel casings, aluminum fans, copper or aluminum tubes and aluminum fins. The units can also be furnished in other materials and constructions.

Capacities range from 66,000 to 7,600,000 Btu per hour.

Rugged casing and motor support construction of horizontal air stream model.

Trane GC Fluid Cooler. Air flows upward through core, unaffected by wind direction.

Horizontal air flow Fluid Cooler, available in 14 sizes, either blow-through or draw-through fan.

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OF HEATING, VENTILATING AND
AIR CONDITIONING EQUIPMENT

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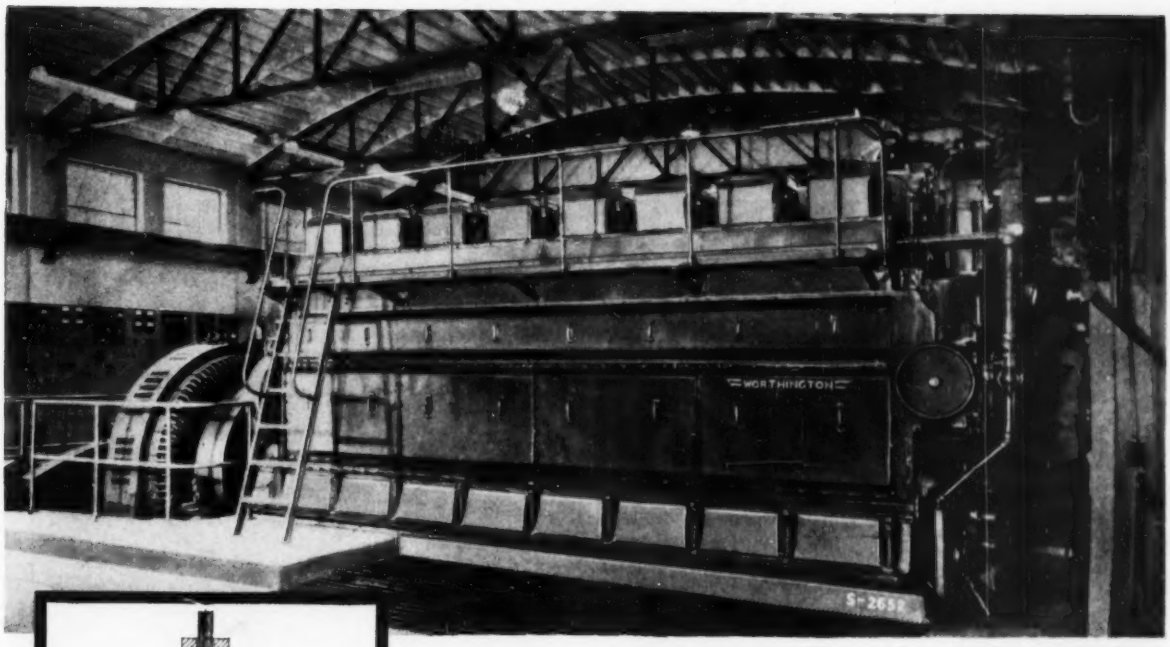
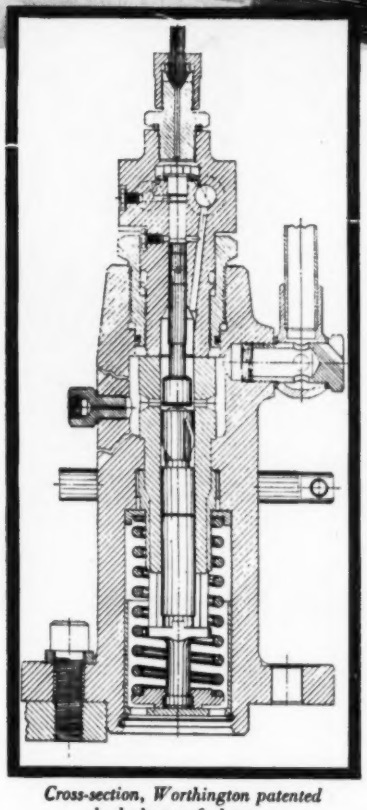




Cross-section, Worthington patented dual plunger fuel pump.

This Diesel Is Ready

FOR A CHANGE IN DIET

Right now this Worthington Diesel—one of three 1760 hp units owned by the city of Tarboro, N. C.—is operating on oil.

But they anticipate natural gas in this area, and this Diesel is ready for it. With slight changes, it can easily be converted.

Worthington's patented dual plunger pumps now completely fuel this engine with oil—producing more perfect atomization, making possible the use of a *heavier* grade of oil. Also: firing pressures are reduced, exhaust temperatures, too, and combustion is improved.

When the conversion to gas is made, the dual plunger pumps will furnish pilot oil for ignition. Conversion is made quickly and at low cost.

For any engine application, call on Worthington—an engine for any fuel: oil (crude or regular), gas or "dual fuel". Worthington's complete line of engines assures you of the most economical operation no matter what fuel you use.

Only Worthington dual fuel engines offer such exclusives as dual plunger pumps, gas micro-metering valves for each cylinder, and automatic thermal air control—all built to give optimum performance for the fuel used.

Write for Bulletin S-500-B 31 C, Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.

WORTHINGTON

ENGINES

E.1.12

ECONOMICAL CONTINUOUS POWER

Diesel Engines, 150 to 2640 hp
Gas Engines, 190 to 2880 hp
Dual Fuel Engines, 345 to 2640 hp

WORTHINGTON-BUILT AUXILIARIES

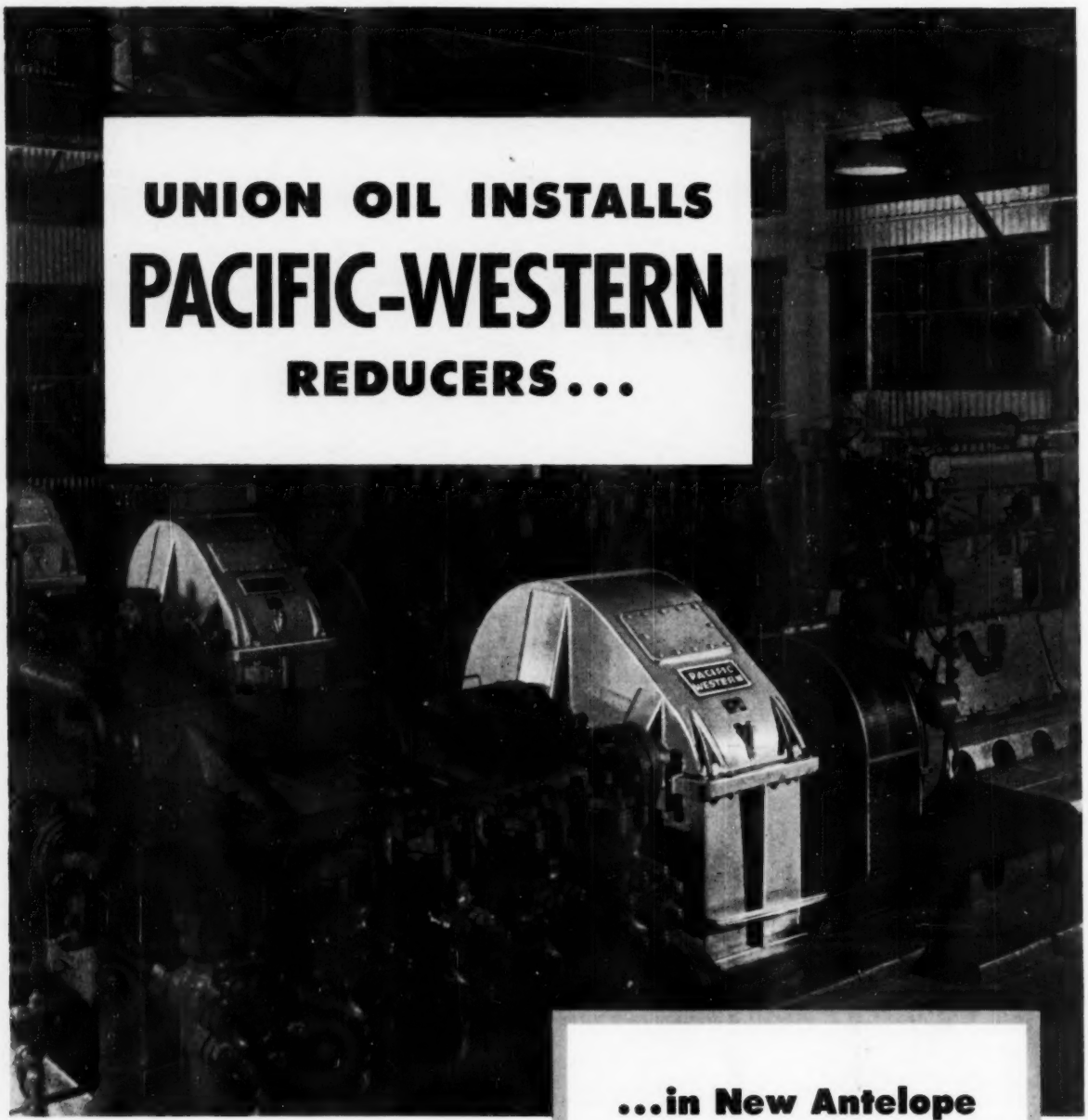
Engine Starting Compressors

Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Coolers

UNION OIL INSTALLS PACIFIC-WESTERN REDUCERS...



The three Pacific-Western speed reducers in the Antelope installation are rated at more than 500 horsepower each, continuous duty, under heavy shock loads. They reduce engine speed of 720 rpm to 124-rpm output for the reciprocating pumps.

...in New Antelope Pumping Station

This crude-oil pumping station, now completely modernized, can serve as a model of efficiency to the industry. In this station, as in many other oil or gas pumping stations throughout the United States, Pacific-Western gear units provide unfaltering service.

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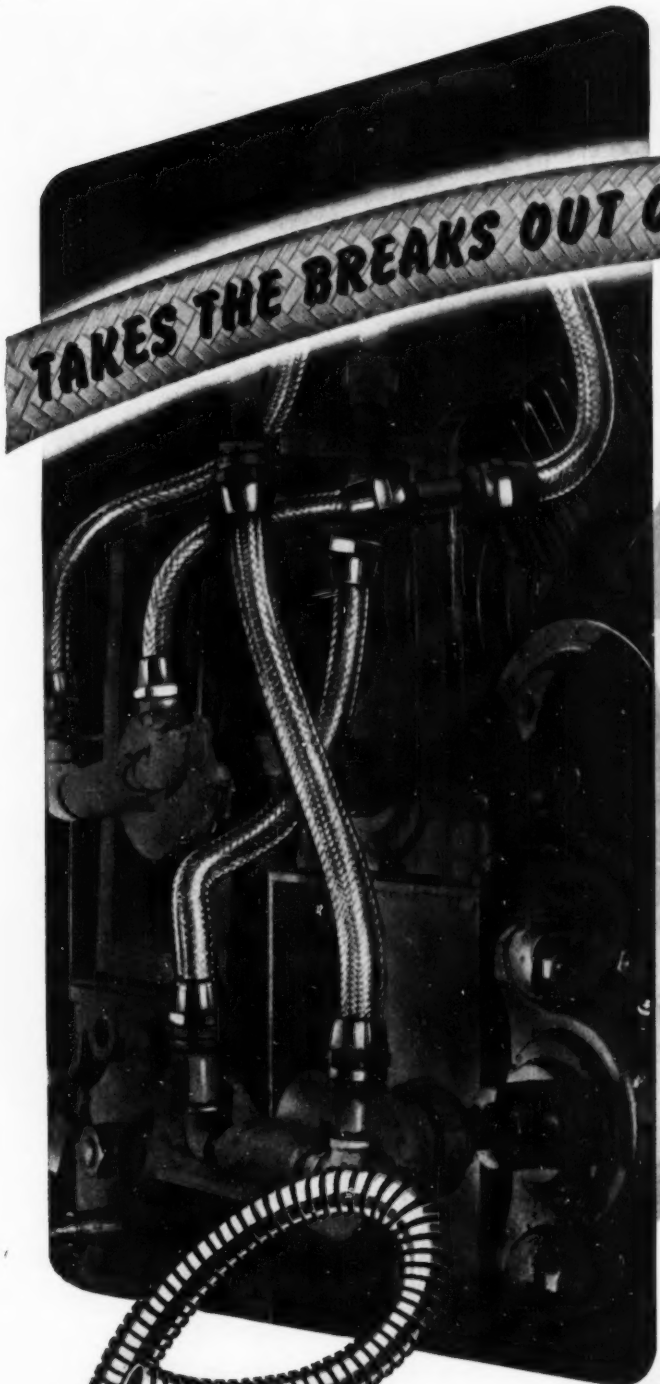
Engineering & Machinery Ltd., 1366 W. Broadway, Vancouver, B.C



PENFLEX FLEXIBLE TUBING CURES BREAKS IN VIBRATING STEAM LINES

One hundred pounds of steam fed to the spinning rollers of a paper laminating machine that was constantly moving a quarter of an inch. Rigid piping crystallized under the high frequency movement, broke and caused shutdowns. Then two years ago this large mid-west paper manufacturer called in Penflex.

The answer was one-half inch and three-quarter inch diameter braided Penflex-weld, equipped with Metseal couplings. This corrugated, all metal welded tubing serves the double purpose of giving flexibility and developing super-resistance against bursting, crushing or breaking. Non-burnable Penflexweld affords complete protection against high temperatures. Vibrating motion is isolated at its source.

Penflex engineers can help you solve flexible tubing application problems. In addition to corrugated welded tubing Penflex manufactures a complete line of four-wall, interlocked tubing from 1/8" I.D. and up . . . automatic barrel fillers, accessories and fittings. Write for the new Penflex catalog that gives the latest data on the application of flexible tubing for the greatest efficiency.

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oil coolers, water coolers—
are tailored to their jobs.
They combine high capacity
with real compactness—
a combination that means much
to designers and engineers.

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have learned
that they can depend
on Harrison units
to do any cooling job—
and do it *right.*
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that Harrison's engineering,
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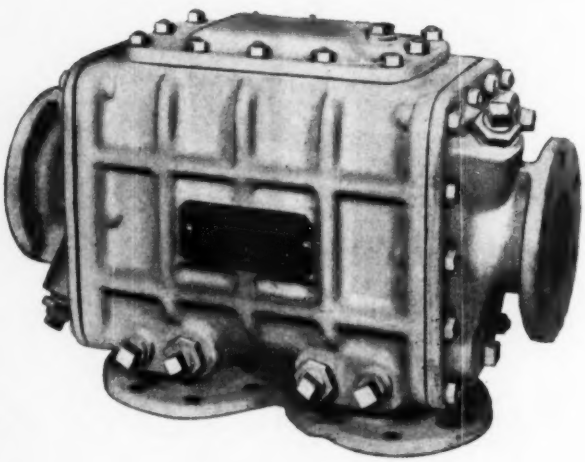

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Vol. 29 No. 11 November, 1951

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Worms-eye view in an oil derrick. Usually an open structure, this one is inclosed in sound-deadening blanketing to reduce noise objectionable to nearby dwellers.

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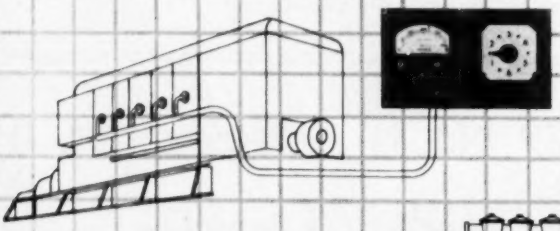
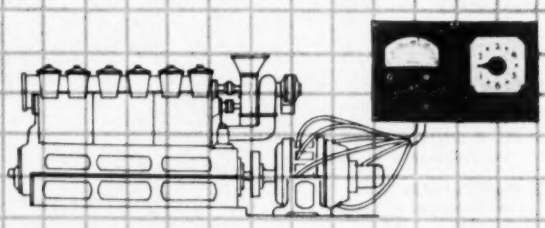
ENGINEERING REPORT

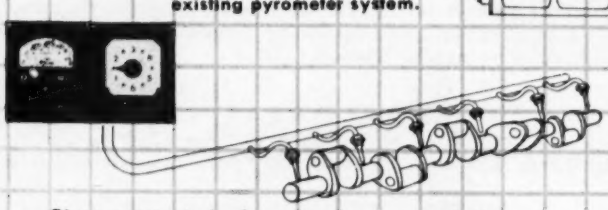
INSTALLATION DETAIL . . . ALNOR PYROTAC



Multi-circuit Pyrotac and Motor-Driven Switch continuously monitor exhaust temperatures. Wiring option—sound alarm, shut down engine or both.

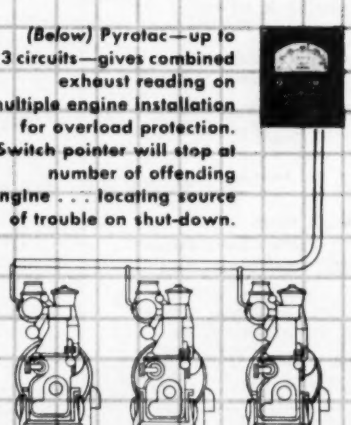
(Right) 6-position switch ideally suited for reading generator field temperatures. Scale can be read from 20 feet. Can be used with either Pyrotac or existing pyrometer system.



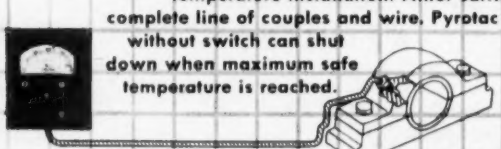


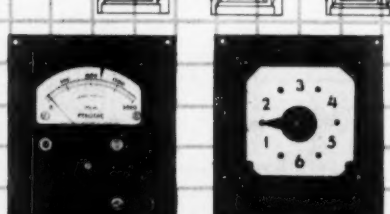
Gives constant check on bearing temperatures. Switch cycle can be interrupted to take close reading of individual bearing. All circuits are non-electronic—need no "tuning."

(Below) Pyrotac—up to 13 circuits—gives combined exhaust reading on multiple engine installation for overload protection. Switch pointer will stop at number of offending engine . . . locating source of trouble on shut-down.



(Below) Thermocouple detail on bearing temperature installation. Alnor carries complete line of couples and wire. Pyrotac without switch can shut down when maximum safe temperature is reached.





Summary: The Pyrotac and Motor-Driven Switch present many opportunities for improved instrumentation in the Diesel and gas engine field. They can be used singly or combined to warn of excessive temperatures in cylinders, entire engines, over-heated bearings, burn-out danger in fields of large generators, etc. Such constant, automatic protection reduces maintenance time and expense to a minimum—increases efficiency and operating economy.

ILLINOIS TESTING LABORATORIES, INC.

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Ask your Alnor representative for assistance in solving your pyrometer problems today!

Alnor

PRECISION INSTRUMENTS FOR EVERY INDUSTRY

Editorial:

Northwest Power Shortage

HYDRO power is a wonderful thing. It is cheap and plentiful—when the water runs! Water shortages and droughts have been splitting the headlines of late with accounts of ravaging floods. In short, water isn't always where you want it and "Old Man Nature" is tough to handle.

Construction of hydro-electric plants on major river systems of the Pacific Northwest is a continuing project, but the influx of industries consuming great qualities of power and the normal expansion of loads in the areas has kept pace. When the supply of water falls off, there is a power shortage.

Lack of water going over the Bonneville dam at the present time is a prime example. In normal times this is a serious problem, but with the national emphasis on increased production —particularly of basic materials—it assumes catastrophic proportions. Aluminum plants were setup in this area to take advantage of low cost power (nearly 10 kw. hr. per lb. of aluminum is needed) so as to produce the metal at the lowest possible cost.

The fact that aluminum is vital to our economy and to the rearmament program is attested to by the fact that it is one of the three controlled materials under CMP. Yet two pot lines, each with a reported annual capacity of 22,000 tons have been shut down due to lack of power.

The seriousness of the situation is such that Mobilization Director Charles E. Wilson has conducted a series of meetings with metal and power experts and representatives of the three major producers of aluminum, Aluminum Company of America, Reynolds Metals and Kaiser.

Mr. Kaiser insists that the situation is temporary and could be overcome by voluntary civilian economizing of electrical power, extension of daylight saving and curtailing the power used by "non-essential" industries. The power would then be available for the potlines. Regardless of how distasteful these emergency measures might appear, they could, if necessary, be justified on the basis of the national welfare.

Alternative suggestions were proposed, the most drastic being to relocate the potlines where power was available. This would be a very costly and time-consuming solution.

One unique suggestion—and this brings us closer to the point of this discourse—was the possibility of using diesel-electric locomotives to provide the necessary power. Electrical characteristics are not too dissimilar: Potlines require direct current at about 667 volts. However, even disregarding costs, where do you get the locomotives, already in short supply?

Diesels cannot be ruled out, however; they could be the answer Plants of this type could be built quicker than those using any other type of prime mover. In addition, they would produce electrical power at a lower cost. While economies could not be expected to be as low as for hydro power nor in the order of the Southwestern plants in low cost gas areas, they would be the lowest possible in view of all the factors.

DEMA has been alert to the situation as is demonstrated by the following text of a telegram sent to Mr. Wilson by Harvey T. Hill, Executive Director:

> "The diesel engine industry offers you its facilities to quickly and economically eliminate the power shortage reported in the Pacific Northwest.
>
> "As you know, the diesel industry has built engines which now supply large segments of the aluminum industry with some of its cheapest and most reliable power, and is now building hundreds of thousands of horsepower for new aluminum plants.
>
> "Our industry has the plant facilities to furnish the necessary equipment to relieve, in a short time, the power plant shortage in the Northwest, which we understand is at least 300,000 kilowatts.
>
> "Our builders of this equipment stand ready to meet with you, or anyone else, at any time to discuss in detail what we can do to relieve this situation."

There it is: A solution to the problem. The estimated minimum shortage of 300,000 kw. is a lot of power. If it was just a matter of meeting a "one shot" emergency the idea might be questionable, but such does not appear to be the case. Water and water conservation is a lively national topic.

The situation is reportedly easing a little in the Northwest, but there is no guarantee against a re-occurrence. Diesel plants started *now* might be mighty important "insurance". Why not use this breather to good advantage?

here's GOOD NEWS for the TAXPAYERS...

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Mr. Roland Bayerlein
Nordberg Manufacturing Co.
Milwaukee, Wis.

Dear Mr. Bayerlein:

I wish to inform you on the operation of the three TSG 215 natural gas burning diesel engines that we purchased from your company and which equipment has been in service in our city for over one year.

We are more than pleased with the generating cost of these units. We were pleasantly surprised to learn that we could operate on less than 3% pilot oil. Our municipal system has, during the past year, paid the annual installment on the bonds required for the installation of this equipment out of the additional profits realized from the economical operation of natural gas fuel generation. In addition, we realized over and above our bonded indebtedness an additional profit of $30,000.00 for the fiscal year ending 1950. This means to us that our present operation over our former operation allows us to pay for the equipment while we are realizing an additional profit.

I am passing this information on to you because I know of the interest that you took in this plant during its construction.

With every good wish, I remain,

Sincerely,

Leon Gary
Mayor

LG/z

NORDBERG Gas Burning Diesels pay for themselves . . . *plus* a profit bonus!

THIS unsolicited letter from Mayor Gary, of Houma, Louisiana, speaks volumes for the economy and performance of Nordberg Duafuel* Engines. The three gas burning units serving this progressive municipality were installed as a result of the foresightedness of Mayor Gary and his associates. Each of these engines develop 2000 hp at 225 rpm, generating a total of 4230 kw in Louisiana's largest Diesel plant.

Can *your* city point to profitable power plant operation like this? If not, it will pay you to investigate the dependable, economical service available with Nordberg Diesels . . . in sizes from 10 to 9600 hp. Write for details, outlining your power requirements.

*(Trade Mark for Nordberg engines burning oil, gas or a combination of both)

NORDBERG MFG. CO., Milwaukee 7, Wisconsin

P571

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A DIVISION OF NORDBERG

NORDBERG
DIESEL ENGINES

+ HIGHLIGHTS +

● Orders for 9657 new freight cars by American railroads in September raised the backlog of new cars on order Oct. 1 to 140,135.

● Two American scientists from the Department of Agriculture are working with the government of Peru to help assure the Free World adequate inventories of rubber.

● Long Island Light Co. benefiting by the completion of the transcontinental pipeline ending at New York is expected to have its large Worthington gas engine in operation by early next year.

● The increased use of diesel engines in trucks is reflected in "Automobile Facts and Figures" published by the Automobile Manufacturers Association, which states that 13,903 units were produced in 1950 as against 5698 in 1948.

● United States will set a new power mark in 1951. It is now averaging over one billion kwh. per day. Generating facilities are one and three quarters what they were ten years ago. Power usage along the more than 1.1 million miles of REA lines, which is about 75 per cent diesel, jumped 25 per cent during the fiscal year ending June 30.

● The Army and Air Force, large users of diesel engines, also use many diesel-powered vessels. These will now be procured by the Navy Bureau of Ships, who will act as a single procurement agent for all services. At the present time the Bureau is purchasing for installation about 377,000 diesel hp. for vessels to be built, some of which are for water activities of the Army and Air Force.

● A new alloy of iron-chromium-aluminum has a maximum operating temperature of 1750° C. This may help solve some diesel and gas turbine troubles.

● Additional diesel-electric capacity recently placed into service has enabled the U. S. primary aluminum industry to increase its output about eight per cent.

● Machine tool industry now estimates its backlog of orders at $1,371,370,000 or more than two years production at the present annual "going rate" of $650,000,000. Need new tools? Get in line boys.

● "Future Sales Ratings" as of October 1, 1951, a breakdown of relative sales prospect ratings, give the diesel engine industry a five star rating. This is indicative of the best relative outlook. The period covered includes the fourth quarter of 1951 and the next twelve months.

● Lignin—the stuff that holds wood fibres together—needs research. So says G. Harvey Benham, Armour Research Foundation, who also sees a potential for its use in adhesives, plastics, resins, etc. Those having cooling towers would welcome research just to keep it where it belongs to avoid troublesome delignification.

● The first diesel-electric locomotive has been built in Australia by the Clyde Engineering of New South Wales in association with the General Motors Corp., which is supplying the power equipment. The new engine is the forerunner of 37 and will be placed in service on the 1100-mile transcontinental run. The locomotives are powered with a 1500-hp. engine.

● A new lube oil synthesized from natural gas is being tested in 57 cities. Preliminary tests indicate that many lubrication problems may be solved.

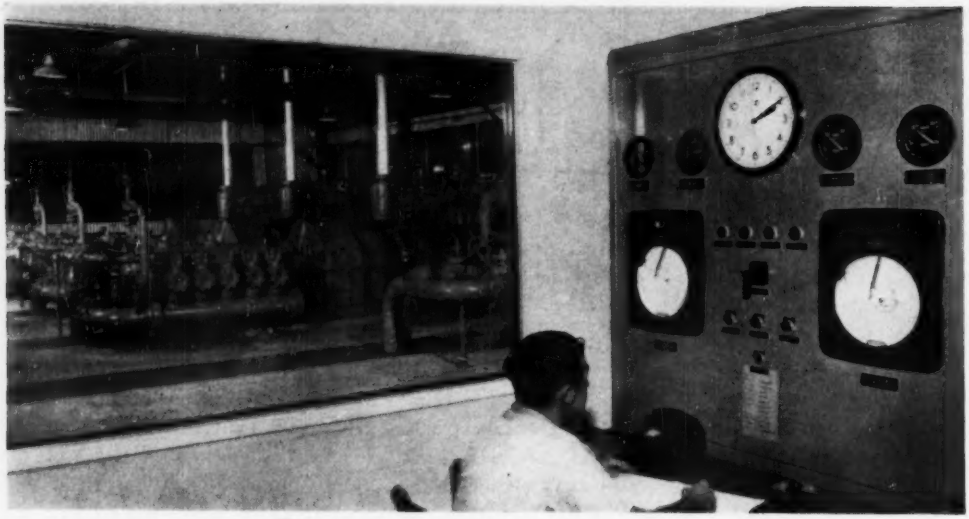
● New York State's new ton-mile tax law has hit a snag. Constitutionality of the law has been contested and the State Supreme Court has ruled that operators will not have to pay the levy pending the court's decision.

● We see in the NPA publication "Scrap Roundup" that DEMA's Executive Director, Harvey T. Hill, is making personal calls on diesel engine makers to flush out greatest possible amount of dormant scrap.

● The new railroad Quebec North Shore and Labrador will purchase 56 diesel-electric road units of 1600-hp. each plus switchers to haul iron ore from mines to the St. Lawrence River port of Seven Islands. The new railroad will be 360 miles long and single track.

● The fuel price pinch is being felt at sea as well as ashore. One system based on the use of Bunker C fuel in diesel engines was recently shown aboard the Shell Oil Co. motor tanker Patella at Seawaren, N. J. A development of John Lamb of Anglo-Saxon Petroleum Co. of England and Shell Oil Co.

● Two new sewage disposal plants are nearing completion. One is the Owls Head plant in Brooklyn with Superior engines and is expected to be in operation by the end of the year. The other plant, is at Bay Park, Long Island, which was built to serve parts of Nassau County. The engine here is a Worthington and acceptance tests are now under way.



Engines and pumping machinery appear as a framed picture when seen from this view of the control room.

Diesels, burning crude oil, take over after 42 years of continuous operation of a steam plant and during most of the year consume some 90 per cent less fuel at . . .

by M. D. Pugh

Union Oil's "Antelope" Booster Station

NEW precedents were set in Union Oil Company's Antelope Pumping station when, without interruption of service, three new Enterprise diesel engines took over the pumping operation. Reputedly the most modern of the Pacific Coast's pumping stations, the booster station is setting precedents in fuel economy and in self-sufficiency.

Self-sufficiency is of prime importance, both economically and operationally, to a remotely located pumping station of this type. Antelope, an integral part of Union Oil's 8-in. main line from their oil fields near Bakersfield, pushes some 1000 bbl. per hr. of 16 API gravity crude 15 miles uphill toward its marine terminal at Avila, California, approximately 60 miles west.

An optimum of self-sufficiency is achieved here by burning this same unrefined pipeline crude in the engines. This, of course, results in a double-edged slashing of overhead expenditures even without regard to the marked efficiency in comparison to the previous steam plant. Only a token supply of distillate diesel fuel needs to be trucked in—its use will be explained later. The biggest advantage here, however, is that it is generally convenient all around to utilize some of the pipeline oil as engine fuel.

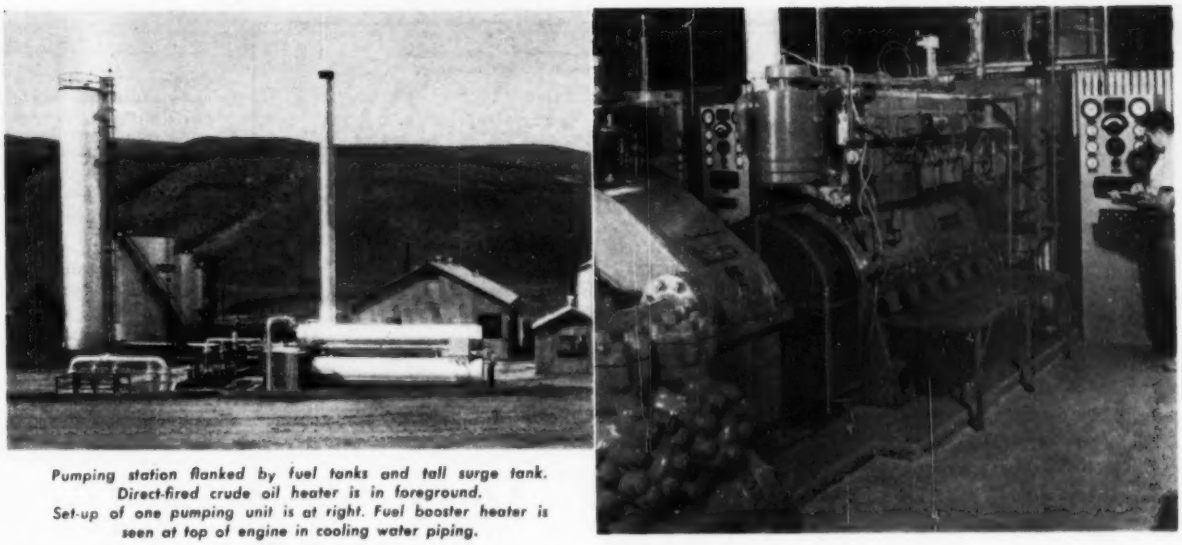
Of interest to the many pipeline and diesel engineers who have witnessed the efficient operation are the engines that go about their business with a constantly clear exhaust while on a diet of unrefined crude having a viscosity of 800 to 1000 SSU at 122° F. The ability of the Enterprise engines to burn successfully crude and residual oil of such severe specifications as that used at Antelope is the result of exhaustive testing and improving on their basic engine models by the organization's research and development staff.

Union Oil's research department, working in conjunction with the Enterprise staff, speeded this development by contributing its specialized knowledge of fuel and lube oil abilities and properties. With this work, it was also possible to test and evaluate Union Oil's products. For example, their newest heavy duty detergent diesel lube oil—Guardol—was used.

Engines

The three Enterprise engines installed are of the M Series, the latest of this engine builder's design, and these are the first of this type to go into industrial service. They are DSM-6's having six cylinders with 8-in. bores and 10-in. strokes. For this particular application they are rated 220 hp. at 720 rpm.

Smallest in the line of Enterprise engines, the M Series, was designed with a wide variety of applications in mind including oil drilling, pipeline pumping and agricultural pumping. Of *enbloc* construction, in contrast to the individual cylinder design of the



Pumping station flanked by fuel tanks and tall surge tank. Direct-fired crude oil heater is in foreground. Set-up of one pumping unit is at right. Fuel booster heater is seen at top of engine in cooling water piping.

larger models, they embody the same heavy duty features.

Great flexibility of application is afforded by the use of structural steel bases that can be extended for mounting radiators, driven equipment, etc., so as to make a compact, self-contained unit. This feature was used to advantage in this installation.

The combustion system is designed to operate on a wide variety of fuels. As a matter of fact, Enterprise has gone on record that this is a characteristic of all of their models. All engines are equipped with an absorbent type filter, an engine-driven booster pump, and a strainer, regardless of the type of fuel to be used. Furthermore, they contend that no change in the basic fuel system is required where a change of fuels is made.

Fuel System

There is, however, the matter of fuel preparation and the method will vary depending upon the specific fuel to be burned. In general, such a system must perform three main functions: cleaning to remove contaminants and water; heating to obtain the proper viscosity; and provision for the use of distillate fuel for starting and stopping the engine.

The latter is an advisable feature that facilitates starting and is used for a brief—say 15 minute—warm-up period and a similar interval before shutting down. This procedure purges the injection system of the heavy crude to insure easy starting on the next run.

In order to perform the three main functions required of a heavy fuel system certain equipment is necessary. Included are:

1. *A heater in the main storage tank for ease of pumping.*
2. *A second heater on or near the engine for a final preheat to the temperature needed to obtain the proper viscosity, determined by experience.*
3. *An insulated day or settling tank for retaining the heat to facilitate separation of the water and solid contaminants.*
4. *A centrifuge to separate the maximum amount of water and suspended contaminants from the oil.*

It is emphasized that all of this equipment is not necessarily required, the items being used depending largely on the particular fuel specifications. A recommended system is illustrated and it will be shown how the principles are adapted to meet the needs of the Antelope station.

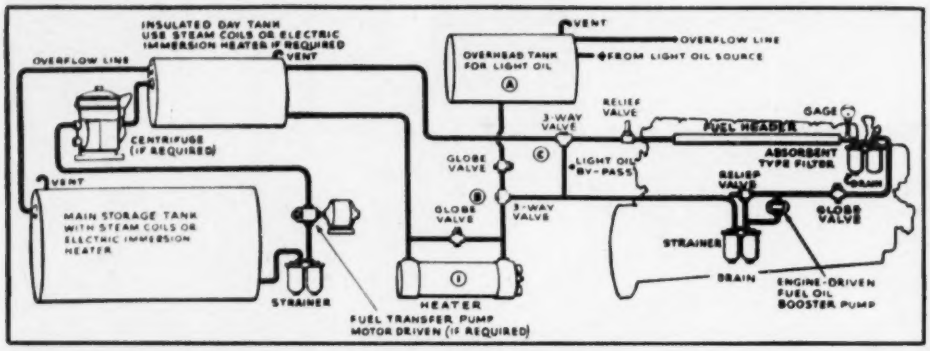
A direct-fired heater is an integral portion of the station's pumping equipment and is used to heat the crude to 170° F for ease of pumping. This would correspond to Item 1, listed above. Some of the heated crude is bled from the line and passed through a centrifuge (Item 4) where the largest possible amount of sediment and water is separated from the fuel. Clean fuel is stored in day tanks (Item 3) and as required is passed through an engine-mounted heater (Item 2) where its temperature is raised to 180° F at which point its viscosity is suitable for the injection equipment. On the engine, it goes through the edge-type filter, the booster pump and a final-type filter to catch any remaining impurities before it enters the Bendix injection pumps for delivery to the cylinders.

It can be seen that the principle outlined is followed quite closely, although adapted to the station layout and facilities. A recent inspection by Enterprise and Union Oil engineers, after one engine had operated 2500 hours, showed that Antelope's engines were operating as efficiently and as cleanly as their distillate fuel-burning counterparts.

Pumping Equipment

Pumps used are Wilson-Snyder positive displacement Quintuplex units. They ordinarily maintain an outgoing pipeline pressure of 800 psi. requiring an engine bmep. of 80 psi. to carry the load. However, there are extensive periods , sometimes stretching into weeks, when the pumps are required to maintain a partial load of just 400 to 500 psi. During such periods the engines are required to and do operate efficiently at a bmep. of only 40 to 50 psi.

Pacific Western reduction gears match engine speed to pump speed. A reduction type unit is necessary in



Circuits for light and heavy oils can be traced. Positioning of 3-way valves (B) and (C) determines the type of fuel used. Valve (B) determines whether heavy oil from heater (1) or light oil from tank (A) enters engine system. Valve (C) directs flow of excess oil to appropriate system for re-circulation.

the case of the positive displacement pumps as opposed to the increasers used in conjunction with the centrifugal type pumping units.

Actually, there is little difference in basic design between a speed reducer and increaser except that at the higher speeds encountered with the increaser there are attendant complications with respect to lubrication, cooling, noise, etc. Precision building with careful attention to accuracy of gear cutting, ample bearing design, rigidity to maintain alignment, and suitability of lubrication and cooling provisions have solved these problems. In the case of the reducers, the same features are an added bonus with regard to dependability and long life.

Provision is made for disconnecting the engine from the load. This is done by means of a Fawick Airflex coupling. In this way the engines can be started and warmed up prior to picking up their load.

One of the advantages of the use of internal combustion engines in pipeline pumping service is the simplicity of maintaining the desired line pressures. Complicated valving arrangements are unnecessary as in the case of constant speed electrical drives. Pressures and flow are very simply controlled by varying the engine speed.

Engine Accessories and Controls

Following the pattern of self-sufficiency, each of the engines is set up as an integral unit, insofar as practical, and is fitted with automatic controls and protective devices so as to minimize the required attendance.

Proper engine speeds are maintained by hydraulic governors with solenoid trip shut-offs. Overspeed trip governors are also installed. Mounted on the gauge board of each unit are both manual and auto controls for regulating the engine speed in relation to line pressure.

Other instrumentation on the control panels includes the normal complement of pressure and temperature gauges, tachometers, pyrometers, and the pneumatic clutch control valve. There is also an automatic shut-down and alarm system with indicating lights.

A closed cooling system is employed on each engine and the radiator and fan assembly is mounted on an extension of the engine sub-base. A lube oil cooler, mounted on the engine maintains a constant oil temperature of 170° F. Its piping arrangement also provides for heating the oil as is desirable for rapid engine warm-up. Full-flow lube oil filters keep the oil in good condition.

Oil bath-type air cleaners keep a maximum amount of air-borne particles out of the engines. Combination spark arrestors-silencers effectively reduce exhaust noises and guard against the dangers of fire.

Considerable use is made of compressed air. This is provided by an air compressor with selective electric or gasoline engine drive. Air is used for the operation of the pneumatic couplings, air cranking motors for engine starting and for the pneumatic controllers that, through the governors, regulate engine speeds.

List of Equipment

Major Components

Engines	Enterprise Model DSM-6's
Pumps	Wilson-Snyder Quintuplex
Speed Reducers	Western Gear Works
Couplings	Fawick Airflex Co., Inc.

Engine Accessories

Radiators	Young Radiator Co.
Lube Oil Coolers	E. C. Cooley Co.
Lube Oil Filters	Honan-Crane Inc.
Air Filters	Air Maze Corp.
Exhaust Silencers-Arrestors	Maxim Silencer Co.
Governors	Woodward Governor Co.
Over-Speed Trips	Syncro-Start Products, Inc.
Air Cranking Motors	Gardner-Denver Co.
Air Compressor	Quincy Compressor Co.

Fuel System

Fuel Heaters	E. C. Cooley Co.
Centrifuge	The Sharples Corp.
Fuel Filters, Edge and Absorbent Type	Purolator Products, Inc.

Instrumentation and Controls

Pneumatic Controllers	The Foxboro Co.
Tachometers	Weston Electrical Instrument Corp.
Pyrometers	Illinois Testing Laboratories, Inc.
Alarm System	Viking Instruments, Inc.

Conclusion

As a result of the successful operation of its Antelope booster station, Union Oil Company is modernizing its Junction pumping plant near Blackwell's Corners. This plant is planned to be exclusively oil engine-powered by summer of next year.

Here again, outdated steam equipment is being replaced by six Enterprise DSM-6's which will also operate on crude fuel tapped from the pipeline. Engine equipment, clutches, gears, and pumps will be identical, but two-fold to that at Antelope.

Washington Slant

MATERIALS PINCH is beginning to be felt as Defense Program starts emergence from tooling stage. Defense Production Administration reports materials demand to be near peak in First Quarter 1952 allocations.

SIZABLE INCREASES IN MILITARY DEMANDS for controlled materials are reported: Steel up 408,000 ton; copper and aluminum up 80,000,000 lb., each. By Third Quarter 1952 some relief is expected as a result of materials expansion projects. Shortages of copper, nickel, cobalt and other alloying metals are still among the major materials problems.

COPPER is in very short supply partially due to prolonged production strike here and longshoreman's strike in Chile. U. S. stockpile was again tapped to the tune of 30,000 ton. Recent agreements with National Lead Company call for a step-up in production of critical materials over five-year period. Copper is included with increased ante listed at 7,087,000 lb. General supply outlook is worse than that for aluminum. NPA recently advised Electrical Industry Committees to "substitute aluminum, wherever possible, for copper which is more scarce."

LEAD SUPPLY is also critical. During September NPA received requests for 97,000 ton of primary pig lead but could only allot 28,000 ton. Inventories rose in early 1951 but sharply declined later in the year due to a substantial drop in imports. Storage battery industry is largest single user.

STORAGE BATTERY MANUFACTURER'S COMMITTEE, meeting with NPA, suggested industry supplies be increased through withdrawal from national stockpile and by government purchases from foreign sources for resale to domestic consumers. In earlier meeting, recommendations included removal of import duties, accelerated negotiations with Canada to increase their exports of lead, and revision of price structures to encourage flow of lead scrap. Allocations, then current, reportedly permitted only one third of orders to be filled. NPA reported no prospect of sizable imports until January, 1952. There was discussion of proposed order limiting production to certain classes and ampere-hour ratings to conserve lead, sulfuric acid and cotton linters.

BEARING INDUSTRY ALSO USES LEAD and, in recent IAC meeting with NPA reported that unless assistance in obtaining lead was forthcoming a critical shortage of bearings may develop. A halt in production of these vital components would curtail output of all types of diesels and internal combustion engines, the Committee pointed out. Also stressed was essentiality of replacement bearings to keep existing engines running. NPA detailed the lead situation and Committee recommendations were that lead be included as controlled material as soon as possible and that problem of replacement bearings be studied.

INTERNAL COMBUSTION ENGINE COMMITTEE has long list of woes principally concerning material shortages affecting component and replacement parts manufacture. Back in Second Quarter 1951 they reported shortages including forgings for crankshafts. Later, complaint was made concerning low level of inventories of replacement parts and components due to the replacement difficulty after sale. Items above will give clue to some difficulties, still found to be prevalent.

LOCOMOTIVE BUILDERS COMMITTEE in a recent meeting complained about First Quarter 1952 Allotments. One builder claimed that inadequate materials may cause shut-down of their Cleveland plant employing 2500 persons. Others reported that similar labor reductions would occur because of the 800 total unit locomotive program, a decrease from 1033 scheduled in previous Quarter. Claim was made that lower allotment was in conflict with the Nation's mineral program. Also, they reported that, in accordance with NPA recommendations, boron steels were attempted as substitutes only to find this steel unavailable. Government officials promised re-examination of the Allotment situation and an investigation of the conflicting reports concerning boron steels, reputedly in good supply.

FIRST QUARTER 1952 ALLOTMENTS have been set. Percentages of total supplies of controlled materials earmarked for the Military are; Steel—12%; Copper— 24%; Aluminum—40%. Allotments for some of the major programs of interest are:

Division	*Total Steel (tons)*	*Total Copper & Copper Alloys (000 lb.)*	*Total Aluminum (000 lb.)*
Engine & Turbine	580,500	29,930	3,900
General Components	1,089,500	172,074	18,000
Motor Vehicle	3,054,131	128,055	77,710
Railroad Equipment	1,640,750	86,360	6,000

Comparison with Allotments for Fourth Quarter 1951 (see Diesel Power, September, 1951) shows first two categories generally up, last two revised generally downward.

A page from history—

"Old 9000" First Diesel-Electric Road Locomotive

by Hugh Jarman

S. F. Dingle, vice-president of operations, Canadian National Railways, receives plaque commemorating building of first diesel-electric road locomotive presented by Mayor C. A. Curtis in behalf of City of Kingston, Ont.

INTRODUCTION of diesel-electric power in North America was pioneered by the Canadian National Railways, when 'way back in 1925 it put several railcars with this type of power in service. Three years later the first road* diesel-electric locomotive was placed in operation. Internationally remembered now as "Old 9000" she was a two-cab job rated at 2660 hp.

As with most new designs, 9000 had certain weaknesses and was eventually scrapped after eighteen years of service. During its life, probably its most spectacular performance was the shattering of the trans-continental speed record. The trip from Montreal to Vancouver, a distance of 2937 miles, was made in 67 hours.

While in service this first diesel-electric locomotive proved many things about operation under actual conditions. The territory over which she ran was rugged, and this one engine handled trains that would require two steam locomotives having a combined maximum horsepower output 50 per cent greater. "Old 9000" proved five very definite advantages of diesel-electric over steam.

(1) Lower fuel costs.

(2) Lower repair and servicing costs.

(3) Greater availability.

(4) Higher utilization of available horsepower over the speed range.

(5) Increased flexibility.

The bodies for the two-unit locomotive were built by the Canadian Locomotive Works at Kingston, Ontario, each one being 47 ft. long.

Engines for the locomotive were supplied by William Beardsmore & Co., Ltd. of Glasgow, Scotland. There were two engines of 1330 hp. each. They were 12-cyl. vee-type, 4-cycle diesels. Electrical equipment was provided by the firm of Canadian Westinghouse.

No. 9000 made her test run from the locomotive works in Kingston to Montreal on November 20, 1928. While no speed trials were attempted on the first trip, it is worth noting that speeds up to 65 mph. were obtained during the 174-mile run.

The gear ratio for the locomotive was designed for high-speed passenger work and enabled the complete unit to develop a continuous tractive power of 42,000 lbs. with a starting effort of 100,000 lbs. Brakes were Westinghouse, type 14-EL. A lead-acid storage battery of 56 cells provided the necessary power for engine starting, lighting, auxiliaries, and control. Train heating was taken care of by a Clarkson oil-fired thimble-tube steam generator, the fore-runner of the present well known and extensively used Vapor-Clarkson steam generator.

This generator was assisted by an economizing boiler which made use of the exhaust gases of the diesel engines. The principle of locomotion was exactly the same as that used in diesel-electric locomotives built today.

However, the appearance of this newly developed 325-ton locomotive did not bear resemblance to its modern counterparts. The color scheme was black, and there were no fancy cowlings, but the design was pleasing to the eye and the performance was remarkable.

On September 26, 1929 Number 9000 (both units bore the same number) made her first official appearance —a run as second section of the International Limited from Montreal to Toronto.

The train arrived in Toronto on time and the new means of motive power had proven itself under actual railway operating conditions. Subsequent to this run which ushered in a new era in rail transportation, the locomotive, designated as a class V-1-a, saw duty hauling important trains on the Cen-

**The first diesel-electric locomotive is historically considered to be the Alco built, Ingersoll-Rand powered switcher with GE electrical components. Placed in service on the Central Railroad of New Jersey in 1925, it is still in operation. This was a switcher and not a road locomotive. American railcars of this period were usually powered with spark ignition engines using either gasoline or distillate for fuel.—Editor*

tral Region of the Canadian National Railways. After making its record breaking run across the continent, it was later used as two separate units, the second section being renumbered to 9001.

Economic ills of the 1930's prevented further experimentation on this locomotive and no new ones of this type were built. These engines were in continuous service for over eleven years, throughout the Provinces of Quebec, Ontario and New Brunswick, until 1939 when unit No. 9001 was ordered scrapped.

With the advent of war with Japan in 1941, a new chapter was written in the history of "Old 9000". She was commissioned by the Canadian Government, and ordered rebuilt by the Canadian National Railways at Winnipeg, Man., covered with heavy armor plate down to the rails, and then camouflaged as a box car. A new GM diesel engine was installed, and it is most interesting to note that the new engine fitted exactly into the position formerly occupied by the Beardsmore engine which it replaced.

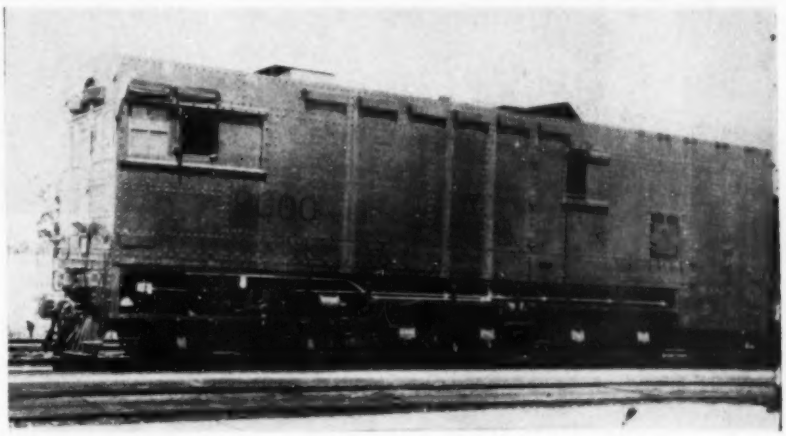
The remodeled locomotive was sent to British Columbia, where it operated an armored train on the Pacific Coast. For obvious reasons the details of this service was not made public, but at the end of hostilities "Old 9000" was again released for civilian railway use. After its return to the Canadian National, the armor plate was removed, but although it was still the same engine she was hardly recognizable in the rebuilt box-like appearance as compared to the original locomotive.

In this form she operated for another fifteen months in regular passenger service between Quebec City and Edmundston, New Brunswick, a distance of 250 miles, where it again proved itself under extremely cold winter operating conditions.

She did not, however, last to meet the new Electro-Motive units now operated by the railroad, but the many diesel-electric locomotives in operation throughout North America today are indirect tributes to "Old 9000", and to those who designed and built her and helped make practical the application of diesel engines to railway operations.

All photos courtesy Canadian National Railways

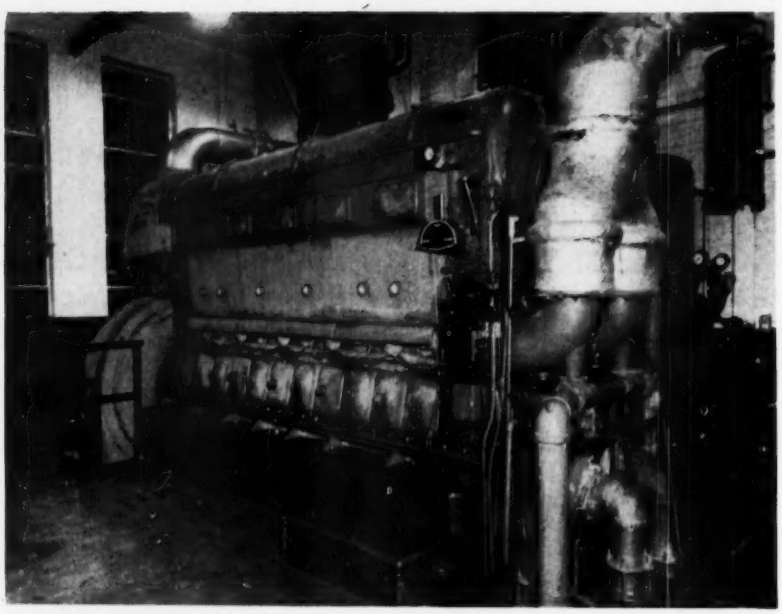
"Old 9000" pulling her regular train. The pioneer of modern diesel-electric locomotives, she still holds the trans-continental (Montreal to Vancouver) speed record. For a number of years she was the most powerful locomotive using this type of prime mover.



Camouflaged as a box car and sheathed in heavy armor, "Old 9000" served in World War II. The lower row of plates were not installed at the time of the picture. Below, the Veteran returns to civilian life. With the armor removed, she retained her box car appearance.

O-P Engine Serving Kansas Utility

Plainville Plant of Western Light & Telephone Co. Traces History to 1905; Modern Opposed-Piston Diesel Brings Peak Efficiency



This 10 cylinder Fairbanks-Morse opposed-piston engine develops 1600 hp. at 720 rpm. and directly drives a 1136-kw. Fairbanks-Morse alternator. During a 28 month period it developed over 9,500,000 kwh., averaging 13.02 kwh. per gal. of fuel.

PROGRESSIVE management of the Western Light & Telephone Company is steadily expanding and improving generating facilities to meet the growing requirements of 47,500 consumers in Kansas and Missouri. In the recent past, new units totaling 20,685 kw. have been installed in plants at Dodge City, Phillipsburg, Concordia, Great Bend, Ness City, Liberty and Medicine Lodge—all in Kansas. These include steam turbines, dual-fuel and diesel engines.

A modern power plant of particular interest is the company's Plainville, Kansas station where one 1600-hp. Fairbanks, Morse opposed-piston diesel is producing power at the most efficient rate in the plant's history which extends back to 1905. This engine was put into service in July, 1948, and in the next 28 months operated 11,313 hours while generating 9,520,500 kwh. The diesel consumed 731,464 gal. of fuel oil for an average production of 13.02 kwh. per gal. of fuel consumed. Not a single enforced shutdown has occurred in this time.

District manager is V. A. Perkins, who started work at the Plainville plant in 1906 when a 100-hp. Corliss steam engine powered a flour mill and incidentally provided a few kilowatts for the town. Progress was steady: a 50-kw., single-phase, 125-cycle generator in 1908, then a switch to a 100-kw., 3-phase, 60-cycle generator in 1911.

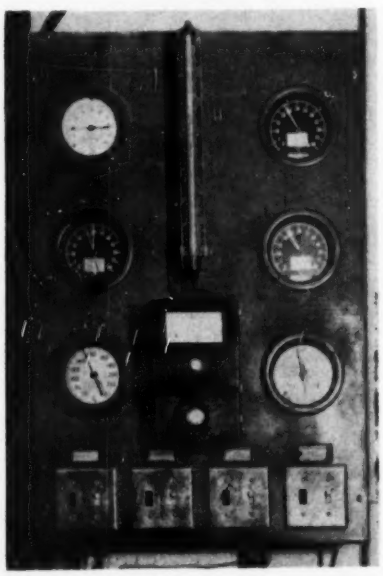
This pioneer plant installed its first internal combustion engine in 1914, a 200-hp., 2-cyl. horizontal oil engine. This was replaced in 1917 by two 200-hp. Fairbanks, Morse type "Y" semi-diesels. These 34-year-old engines still serve as standbys and can be used in an emergency. With added power, the plant began to offer its services farther afield. In 1924, it was sold to a utility company and when the mill shut down, it became wholly a utility plant. In 1927 a connecting line was run to Paradise and the next year the plant was linked to the generating station at Ellsworth. The progress of taking on new customers continued with more nearby towns coming into the fold.

The corporate history of the utilities that controlled the plant was one of growth and merger culminating in the present Western Light & Telephone Company which was organized in 1935 and absorbed the Kansas Power Company in 1945. Expansion since the merger has been phenomenal. In 1945 peak load was 22,000 kw.; in 1950 it topped 42,000 kw. In 1945, the system produced 84,755,000 kwh.; in 1950 production exceeded 150,000,000 kwh. Total generating capacity in 1945 was 29,000 kw. of which 11,550 kw. was diesel; in 1950, generating capacity was 50,500 kw. of which 22,150 kw. was diesel.

In 1948 the company built a new power house at Plainville and installed the Model 38D8⅛ Fairbanks, Morse diesel. This 10-cyl., opposed-piston engine has an 8⅛-in. bore, a 10½-in. stroke, and develops its rated 1600 hp. at 720 rpm.

The new plant is very compact and

Instrument board for alarms, gauges, and exhaust pyrometer.



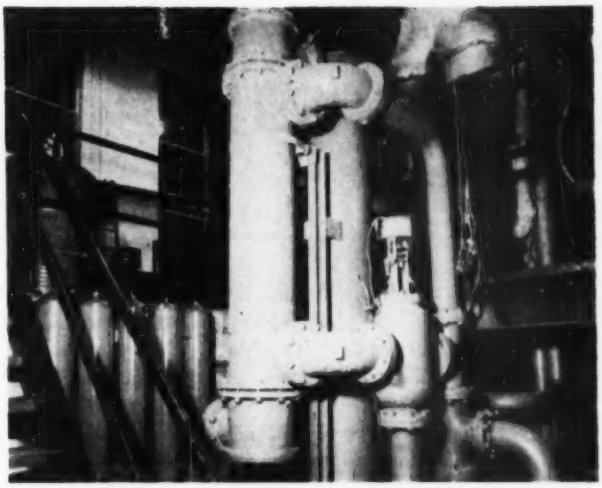
was designed for ease and efficiency of operation. It can function, as it normally does, as a link in the big utility system, feeding its share of power to the high line or, if necessary, it can operate as a wholly self-sufficient plant, supplying the needs of Plainville and the surrounding territory.

The prime mover itself is compact for a heavy-duty engine, occupying little floor space for the horsepower it produces. Complete accessory equipment is arranged for automatic operation and convenient servicing. The engine drives directly a 1136-kw., 1563 kva. alternator with a 15-kw. direct-connected exciter. Both the main lubricating oil pump and the centrifugal jacket water pumps are gear-driven off the engine. Soft water is circulated through the engine jackets and through a shell-and-tube heat exchanger. A pair of motor-driven centrifugal pumps put raw water through the exchanger and a two-cell, induced-draft cooling tower. An automatic thermostatic control keeps the jacket water at prescribed temperature. The water is analyzed daily and makeup is treated with chemicals to reduce hardness.

Lubricating oil is pumped from the engine sump to all the bearings and to cooling jackets within the pistons. Some oil is by-passed continuously from this pressure system through a five-unit filter with cellulose cartridges. In the full-flow circuit is a shell-and-tube oil cooler with an automatic thermostatic control to regulate lube temperature. The plant also has a motor-driven auxiliary lube pump.

Scavenging air for the two-cycle diesel is drawn from outside the building through twin air filter-silencers. These filters are of the oil-bath type. The air reaches the engine through a single header and is supplied to the cylinders by a built-in scavenging blower. The dual exhaust headers are joined outside the engine and vent through a single exhaust silencer on the plant roof. Starting air for the diesel is supplied by a motor-driven compressor with automatic pressure control.

The plant has a 35,000-gal. underground storage tank to permit quantity purchases of fuel oil for whatever price advantage can be gained. The oil is unloaded by gravity and is pumped as needed through a meter to a 1048-gal. day tank, then through cartridge type filters to the engine.



Jacket water is circulated through a Ross heat exchanger and lubricating oil through a Ross oil cooler. Water and oil temperatures are automatically regulated by Fulton Sylphon. At left is the 5 unit Fairbanks-Morse cellulose lube filter.

Like the other equipment in the plant, instruments are complete and compactly arranged. A single gauge panel holds an exhaust pyrometer and gauges for jacket water temperature, raw water pressure, fuel pressure before and after the filter, lube pressure before and after the filter, and lube pressure at the engine. There are alarms on jacket temperature, raw water pressure, lube temperature and lube pressure. The switchboard has four panels and a swinging synchroscope panel and holds ammeters, voltmeter, pf meter, hour meter, recording kw. meters, totalizing kwh. meters, recording voltmeter, circuit breakers and overcurrent relays.

The engine has run with a minimum of maintenance. As a regular preventive maintenance schedule, Mr. Perkins plans to pull pistons every 10,000 engine hours.

Economic considerations make it advisable for the company to produce as much power as possible with gas-burning prime movers but the rapid growth of consumer demand has necessitated regular operation of oil-burning units too. Such efficient, decentralized plants as the Plainville station, however, have played an important part in building and maintaining the utility's reputation for dependable service.

Principle Equipment Listing on F-M 1600-hp. OP Engine
For Plainville, Kansas Plant of Western Light & Telephone Co.

Engine	One 10-cyl., 1600-hp., Model 38D8 1/8, opposed-piston diesel operating at 720 rpm. Fairbanks, Morse & Co.
Alternator	One 1136 kw., 1563 kva., 3-phase, 60-cycle, 2400/4160 volt alternator with direct-connected 15-kw. exciter Fairbanks, Morse & Co.
Governor	Woodward Governor Co.
Fuel oil	Socony Vacuum Oil Co.
Lube oil	Vacme No. 3, Socony Vacuum Oil Co.
Lube filter	Fairbanks, Morse & Co.
Auxiliary lube pump	Fairbanks, Morse & Co.
Oil Cooler	Ross Heater & Mfg. Co., Inc.
Water pumps	Fairbanks, Morse & Co.
Heat Exchanger	Ross Heater & Mfg. Co., Inc.
Air filters	Vortox Co.
Exhaust silencers	Maxim Silencer Co.
Air compressor	Fairbanks, Morse & Co.
Air tanks	Morrison Bros.
Switchboard	Barr-Thorp Electric Co.
Switchgear	Westinghouse Electric & Mfg. Co., Inc.
Recording volt-meter	The Bristol Co.
Gauges	Ashcroft Div. Manning, Maxwell & Moore, Inc.
Pyrometer	Alnor, Illinois Testing Laboratories, Inc.

Preparing Fuel for Pipeline Engines

by D. E. White*

It is desired to discuss briefly the preparation of fuels for internal combustion engines as used for pipeline pumping. As practical men, we must use practical methods with our fuel problems. Therefore, I will not attempt to go into the various theories involved in the preparation of fuels, but will stay with current ideas and practices in every day use. In the pipeline business we use quite a variety of fuels to operate our engines, but they are all some form of hydrocarbons, either in the gaseous or liquid state.

Natural Gas—Sweet and Sour

In the south-west area, natural gas is one of our most plentiful fuels, and the problem of preparing it for use is relatively simple if the gas is sweet, that is, free of H_2S (hydrogen sulfide). If H_2S is present in harmful quantities, then we have a problem. The preparation of sweet gas requires little effort or time. It is necessary to remove only foreign solids and water that have been picked up by the gas in flowing through the pipelines and other vessels to the point of consumption, and possibly wet gas, that is liquid petroleum, which may be carried with the gas from the well separators and is condensed in the line.

Since gas is relatively light, solids and liquids will drop out if the flow is arrested or the velocity of the gas is reduced to a very low figure. To remove the solids and liquids, we pass the gas through a scrubber capable of removing solids and most of the liquid just before it enters the engine.

The type of scrubber that we normally use is a round chamber, relatively tall, depending on the size of the engines, with overlapping, horizontally inclined baffle plates welded into the walls. The baffles are alternately cut away on opposite sides of the chamber so that the gas, as it enters near the bottom, must zigzag over and around every baffle plate before it leaves at the top.

In making its way from the bottom to the top at a very low velocity, the gas drops all of its solids, and most of its condensate settles out in the bottom of the scrubber. A drain valve is provided in the bottom to blow out any solids or liquids.

There are several mist or moisture extractors, for wet gas, available to the industry. These do a very good job of removing liquid from the gas that the above described scrubber may not completely eliminate.

The scrubber has an important function other than cleaning the gas. It acts as a low pressure reserve gas chamber between the low pressure reducing regulator and the engine. This chamber serves as a log and is important for smooth, efficient engine performance. On large installations with multiple units, separate logs, in addition to the scrubbers, are used to provide a reserve of gas. Careful consideration should be given to the design of the complete gas fuel system.

Quite a large percentage of the natural gas in our oil and gas fields is contaminated with an excessive amount of H_2S that presents quite a problem, since it is very harmful to the working parts of an engine. It combines with the moisture created by combustion and forms hydrosulfuric acid which eats away the cylinder walls, valves, and rigs and greatly reduces their life. The H_2S also goes into the crankcase if there is piston blow-by, that is, burnt gases which escape past the piston rings. In the crankcase it combines with condensed moisture to form acid that plays havoc with bearings and shafts.

This crankcase and upper cylinder trouble can be greatly reduced by keeping the temperature of the entire engine up to around 220° F. This eliminates all moisture in the engine, but requires a special cooling system and crankcase insulation.

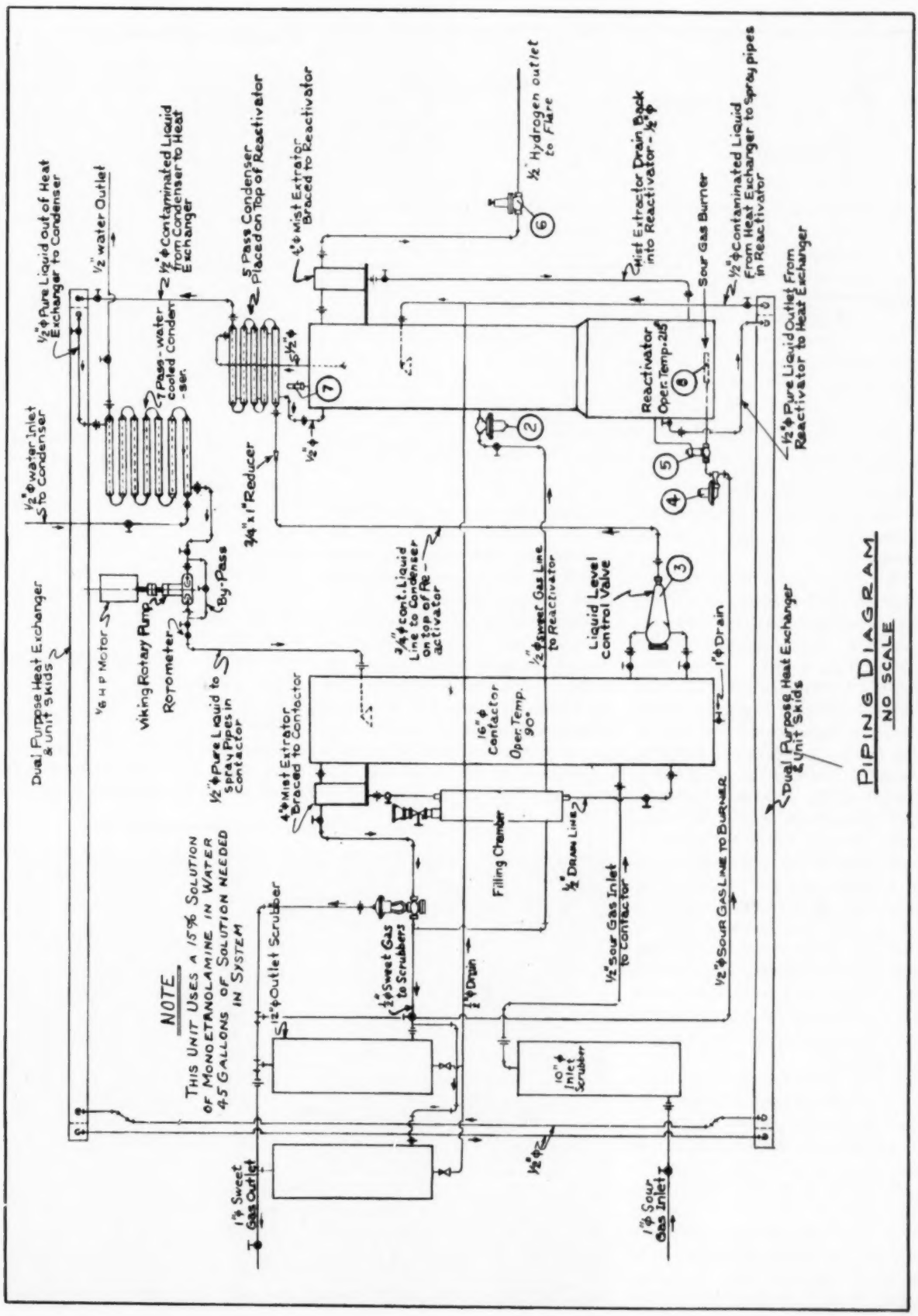
We believe that the correct approach is to remove the H_2S before it enters the engine. We always purchase sweet gas whenever possible, but sometimes we are required to use the available sour gas. There are several methods of treating this sour gas and purifiers are made in various sizes and types, but little has been done toward developing a low capacity, small unit, at a reasonable cost that is capable of purifying gas for small installations requiring two or three medium size engines.

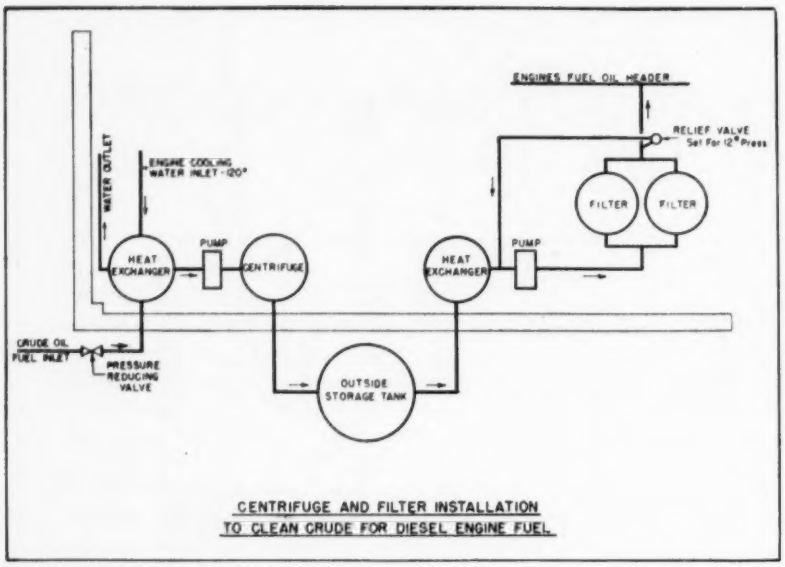
We have, with the help of our engineering department, constructed a relatively small "package unit" Amine plant for the removal of the H_2S. Several articles have been written in the past on gas sweetening, but I will briefly describe our unit.

Amine is an abbreviation or shortened name for the chemical compound Monoethanolamine. At around 90° F an Amine solution will absorb H_2S when they come in contact. After the Amine solution has become contaminated, the H_2S can be driven off by heating the solution to about 215° F.

To make use of this principle in our purifier plant, the sour gas is brought into the bottom of a contactor chamber loaded with small porcelain spools called "Raschig Rings". The Amine solution is pumped into the top of the contactor and sprays over the "Raschig Rings", covering the contactor and making contact with the gas as it rises to its outlet. The gas, as it leaves,

*Superintendent of Maintenance, Magnolia Pipe Line Company, Dallas, Texas.


½"ϕ Pure Liquid out of Heat Exchanger to Condenser
½" water Outlet
½"ϕ Contaminated Liquid from Condenser to Heat Exchanger
5 Pass Condenser Placed on Top of Reactivator
¼"ϕ Mist Extrator Braced to Reactivator
½" Hydrogen outlet to Flare
Mist Extractor Drain Back into Reactivator - ½"ϕ
Sour Gas Burner
½"ϕ Contaminated Liquid From Heat Exchanger to Spray pipes in Reactivator
½"ϕ water Inlet to Condenser
7 Pass - water cooled Condenser
Reactivator Oper. Temp. 215
½"ϕ Pure Liquid Outlet From Reactivator to Heat Exchanger
Dual Purpose Heat Exchanger & Unit Skids
¾"x1" Reducer
By-Pass
¾"ϕ cont. Liquid Line to Condenser on top of Reactivator
½"ϕ Sweet Gas Line to Reactivator
Liquid Level control Valve
1"ϕ Drain
½ H P Motor
Viking Rotary Pump
Rotometer
½"ϕ Pure Liquid to Spray Pipes in Contactor
4"ϕ Mist Extrator Braced to Contactor
16"ϕ Contactor Oper. Temp. 90°
Filling Chamber
½" Drain Lines
½"ϕ Sour Gas Inlet to Contactor
½"ϕ Sour Gas Line to Burner
Dual Purpose Heat Exchanger & Unit Skids
NOTE
This Unit Uses a 15% Solution of Monoetanolamine in Water 45 Gallons of Solution Needed in System
12"ϕ Outlet Scrubber
1"ϕ Sweet Gas to Scrubbers
1"ϕ Drain
10" ϕ Inlet Scrubber
½"ϕ
1"ϕ Sweet Gas Outlet
1"ϕ Sour Gas Inlet
PIPING DIAGRAM
NO SCALE



CENTRIFUGE AND FILTER INSTALLATION
TO CLEAN CRUDE FOR DIESEL ENGINE FUEL

is free of the H_2S or practically so, depending upon efficiency of the contactors.

The contaminated Amine solution flows through a dump valve via a heat exchanger into an evaporator chamber. The evaporator is made somewhat like a small boiler or water heater. A thermostatically controlled burner is used for heating it to keep the temperature up to about 215° F. The H_2S gas that is driven out of the Amine by the heat, is passed out at the top of the evaporator through a back pressure valve and is burned with a flare.

A small electric motor-driven pump is used to pump the Amine solution from the evaporator, via the other side of the heat exchanger and into the contactor chamber. The heated solution passing from the evaporator to the contactor will have to be cooled. By passing both streams through the same heat exchanger, both purposes are achieved.

In extremely hot weather, the Amine solution passing from the evaporator to contactor is partially cooled by water in an auxiliary exchanger, but in ordinary weather, the unit is complete within itself and needs no cooling water.

At this time, we have built only one unit and have made no changes in it, but I understand that some small units are being manufactured and have been available for some time. The use of Amine purifiers is very satisfactory in large plants and we believe that it has definite possibilities in the small "package unit".

There are units available, for isolated locations where gas and fuel oil are not obtainable at economical rates, that convert crude oil to gas for fuel. By heating the crude with the engine exhaust and topping off the light ends, gas is obtained for fuel. This gas is either sweet or sour depending upon the crude used.

Gasoline and Diesel Fuel

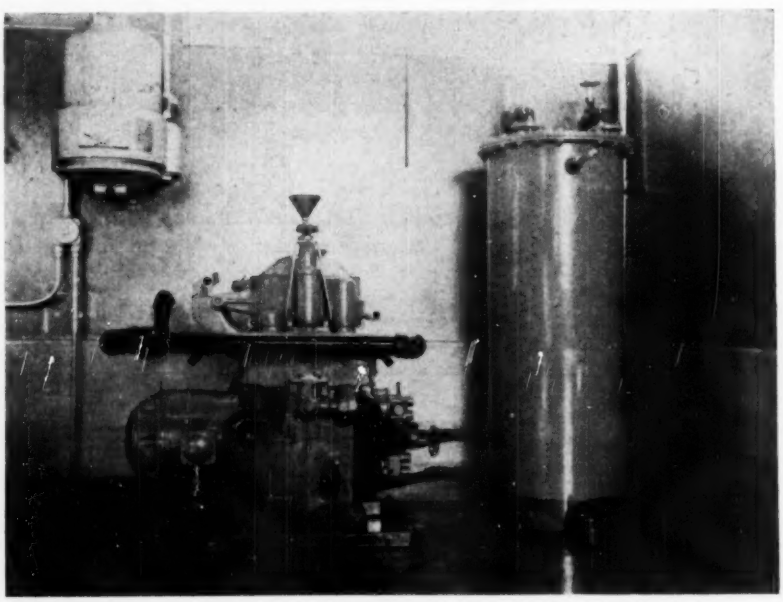
The problem of cleaning liquid fuel of its impurities normally requires more effort than natural gas. Gasoline and diesel fuel, even though they are refined products, often contain particles of sand, dirt, pipe scale, and water in spite of the efforts that refiners and marketers use to keep them perfectly clean.

For cleaning gasoline on small engines, the ceramic bowl type filter is probably the most popular and effective, whereas, the excelsior packed filter, designed especially for the removal of water, is used very effectively on the larger sizes almost exclusively.

Diesel fuel is often contaminated with particles of sand, dirt, and pipe scale to a greater degree than gasoline. There are numerous filters on the market that will do an excellent job of removing these harmful particles from the fuel. The more popular types are the cotton waste packed and cartridge filters, the bag type, the edge type, the fine screen, and various Fullers earth and paper type filters. All are capable of cleaning the fuel, if properly installed and maintained.

Some will do a much better job than others, but I will not attempt to point out their respective merits, as

Centrifuge and heat exchanger for fuel oil in a pipeline pumping station.



much has been published along this line.

Filters should be located as near the fuel header on the engine as possible and still be easily accessible for cleaning. Engines that run continuously for long periods of time should be equipped with duplex units in order that one filter may be changed while fuel passes through the other to avoid shutting down the engine at this time.

Fuel for diesels using high pressure, close clearance injectors and pumps, such as those used on modern engines, must be perfectly clean for good performance and long injector life. For this reason, some of these units have small ceramic filters built in at the fuel pumps inlet. With a properly cleaned fuel of the correct grade for the engine, little trouble should be experienced with injectors or nozzles.

Diesel fuels are sold in several grades and it is important to buy the correct fuel for your engine. Engine manufacturers will generally pass on the merits of a particular fuel for use in their engines and their recommendations should be adhered to.

Crudes

Pipeline companies for many years, in fact, since the early days of the industry, have used the crude oil that they transport through the pipelines for engine fuel. Our problems in using this crude oil for fuel varies in complexity according to the type and quality of the crude and the type of fuel injection system with which the engines are equipped. Some of the crudes that we pump make very good fuels with a minimum of cleaning for the heavy, slow speed diesels that we have had in service for many years. In fact, the engines perform well and the crude burns just as cleanly as diesel fuel.

This crude can be cleaned for our use by letting it "settle out" in large fuel tanks, draining off the accumulated water and then filtering out foreign solids and traces of moisture. These same crudes can be used very successfully in our medium and high speed diesels with close clearance fuel pumps and injectors, if the crudes are thoroughly cleaned. Absolute cleaning is more important in these engines than in our older engines of earlier design.

Other crudes that we handle are very difficult to use even on the heavy duty slow speed diesels. In some cases, we have found it advantageous to buy diesel fuel and have it hauled to the stations in order to keep down excessive maintenance and operating expenses.

The two factors that have caused the most trouble in these problem crudes, are sulfur and salt. By filtering or centrifuging the crude, we can remove the solids and moisture, but we do not remove all of the salt and sulfur which are in solution.

Some of the troubles caused by the presence of excessive sulfur are leaking spray valves, broken spray valves springs, leaking gaskets, and the pitting and corrosion of fuel pump barrels, plungers, nozzles, and pintles. Some engine manufacturers claim that fuel with a sulfur content of 2 per cent or less is not objectionable, and diesel fuels are acceptable up to 2 per cent sulfur, but we have considerable corrosion trouble with a sulfur content of less than 0.3 per cent in our fuel.

The presence of excessive emounts of salt seems to cause trouble by building up crustations over the tip of the injector nozzles. Of course, we do not use these problem crudes unless it is necessary to do so but some of the crudes that we have to use, because of location and necessity, in our medium and high speed diesels are neither clean nor very sweet. Much care and effort is required to prepare these crudes so that they will burn as an acceptable fuel.

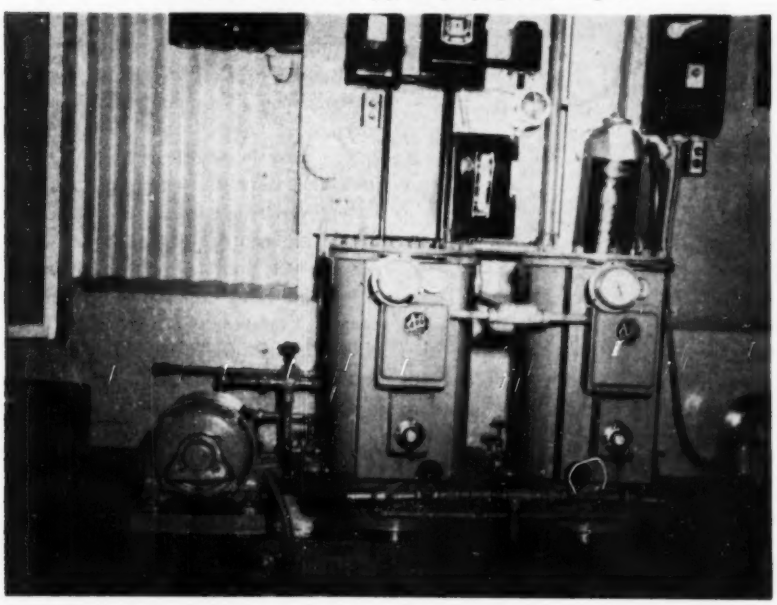
The crude is taken out of the pipeline and passed through a heat exchanger to raise its temperature to about 100° F. A small amount of inlet circulating water from an engine, the temperature of which is about 120° F, is used in the exchanger to heat the oil. The crude passes through the heat exchanger and into a centrifuge for cleaning.

If this crude, sometimes loaded with wax, is not warmed to about 100° F, the centrifuge will often plug up with the wax. The crude is pumped from the centrifuge to an elevated storage tank outside of the station and held as a reserve of cleaned fuel.

From this reserve tank, fuel is piped into two overhead day tanks inside the station. After the fuel has been allowed to settle in the day tanks, it is pumped by a fuel transfer pump through a duplex filter unit into the fuel header feeding the engines in the station. Periodic "shake-out" tests are

(*Continued on page 60*)

Fuel oil pump and filter for pipeline pumping station engines.



DIESEL BRIEFS

Diesel Tractors Speed Up Ore Boat Unloading

Unloading of ore boats at the Wisconsin Steel Co. docks in Chicago have been completely mechanized with a saving in both time and manpower.

Two International diesel-powered TD-14A crawler tractors equipped with Bucyrus-Erie bulldozers do the work of several hand laborers. The savings that have been effected have long been recognized, but could not be taken advantage of until this year when two Wellman ore unloading rigs with 12-ton buckets replaced the smaller rigs. The small rigs could drop the crawlers into the holds but due to the rise of the ship during the unloading, did not have sufficient height to lift the tractors out of the empty ship.

This adaptation of diesel power to materials handling in a confined space is one more instance that this type of equipment can be safely operated under such conditions. Lately, there has been considerable dissension about the use of diesels for underground mining of coal. In this case also the equipment has proved itself entirely reliable and safe and the charges against it unfounded. Recognition of the safety and advantages of diesels for such applications in possibly hazardous locations would greatly extend their use in numerous fields of materials handling.

ASME 1951 Annual Meeting to be Biggest Ever Held

A record program has been announced by the American Society of Mechanical Engineers for its 1951 annual meeting in Atlantic City, N. J., November 26 through 30. At this meeting the Oil and Gas Power Division will sponsor two sessions, and co-sponsor two more.

The sponsored sessions will include a paper by P. H. Schweitzer Monday morning, Nov. 26, on "Research in Exhaust Manifolds", and a General Technical Committee Meeting Tuesday morning, Nov. 27. Monday evening, Nov. 26, Mr. Van Sant, of the Gulf Oil Co. will present "Diesel Fuel Performance". This paper is co-sponsored with the Fuels Division. Thursday evening, Nov. 29, in co-sponsorship with the Railroad Division E. W. Kettering of the EMD will present "Development of the General Motors Two-Cycle Railway Diesel Engine."

Southwest Automotive Show Diesel Clinic

Buda, Hercules and Cummins diesel engines will be set up in a special interest clinic in the forthcoming Southwest Automotive Show to be held in Houston March 20-23, 1952.

Each manufacturer will have diesel engineers present to discuss power problems with fleet operators and others interested in the use of diesel power. It is expected that all major engine manufacturers will be included in this large exhibit which will become an important part of this 10th annual show, expected to attract a large attendance from the four state Southwest area.

About 250 nationally known manufacturers of automotive shop equipment, tools, parts, accessories, chemicals, and supplies will occupy more than 500 booths in the Sam Houston Coliseum.

First GM Locomotive Built Outside North America

The first General Motors diesel locomotive built outside the North American continent was put into transcontinental passenger service in Australia yesterday. Officials of General Motors and its Electro-Motive Division at LaGrange, Illinois, participated in ceremonies at Port Pirie, South Australia marking the opening of the new service.

The new locomotive, a special export type generally patterned after the F type so widely used in the United States in both freight and passenger service, was built by Electro-Motive's Australian affiliate, the Clyde Engineering Company, Pty. Ltd., at Clyde, N. S. W. Power plant, transmission equipment and controls were supplied by Electro-Motive from LaGrange.

The first Australian GM diesel went into service on the crack train of the Commonwealth Railways on the Transcontinental Railway from Port Augusta to Kalgoorli. The new locomotive cuts 20 hours off the previous

DIESEL BRIEFS

3-day schedule for the 1051-mile run. Until new passenger cars, now on order, are acquired the top speed of the train is limited to 75 mph.

Clyde Engineering Company has an order for ten more of this type of locomotive. They will replace 47 steam locomotives on the Commonwealth Railways. This order will be followed by construction of 26 locomotives of a slightly different type for the Victorian Railways Department.

The new Australian diesel has 1500-hp., is 61 ft. long and 14 ft. high, weighs 108 tons, has maximum speed of 70 mph., and a maximum tractive effort of 50,000 lbs.

Fuel Price Increase

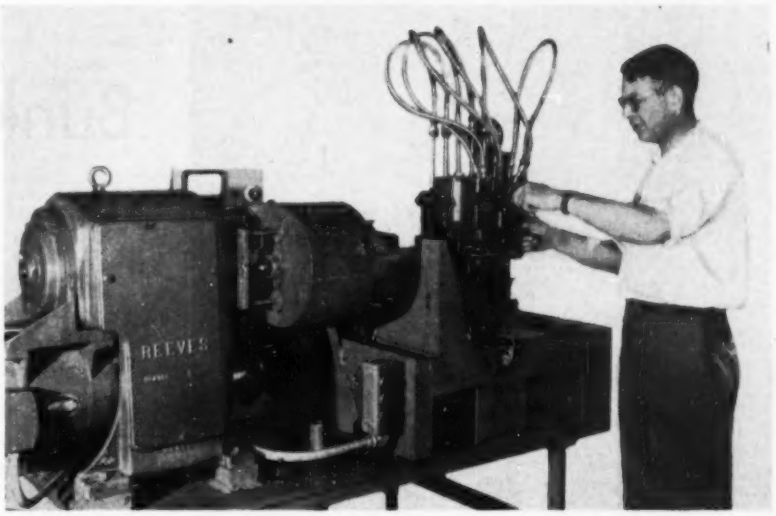
Increases in ceiling prices for kerosene, distillate type burning oils, and diesel fuel, ranging from 3/10 to ½ cent per gallon at the tank wagon level in a group of midwestern states, were authorized recently by the Office of Price Stabilization.

In a supplementary regulation (SR 3 to CPR 17, effective October 30, 1951,) OPS provides that the tank wagon ceiling price on December 13, 1950, or the nearest prior date that a sale was made, plus the following:
(1) ½¢ per gal. in Wisconsin, Minnesota, North Dakota, South Dakota, Iowa and Kansas.
(2) 3/10¢ per gal. in Arkansas, Indiana, Missouri, Nebraska, Michigan and Illinois (except in the metropolitan Chicago area).

Tank wagon distributors sell their products to consumers and retailers. The retailers are permitted under Ceiling Price Regulation 13 to pass the increase on to the consumer.

September Record

More new orders for locomotives were placed in September this year by the railroads than in any other month on record, the Association of American Railroads announced today. In that month, they ordered 459 locomotives, of which 444 were diesel-electric and 15 were steam.



Standarized Fuel Pump Testing Equipment for Cummins

Research by Cummins Engine Company, Inc. has resulted in a method of standardizing Cummins' diesel fuel pump testing equipment and testing procedures. The method developed is being used by Cummins dealers who recognize the need for standard fuel pump testing as the best way to achieve uniform results. Hydraulic characteristics may differ between fuel pump test stands and sometimes cause variable quantities of fuel to be delivered by the same pump when tested on different stands. Cummins is now aiming at standard servicing methods and test procedures in order to assure Cummins users comparable results with their equipment.

This brought the total number of new locomotives on order on October 1 to 1827 compared with 1439 on order on the same date last year. Of the new locomotives on order on October 1 this year, 1802 were diesel. In addition, 23 steam and two electric locomotives awaited delivery.

Installation of new locomotives in the first nine months of 1951 totaled 1856 of which 1840 were diesel, 14 steam and 2 electric.

Certificates of Necessity

Defense Production Administration recently issued a list of 456 approved certificates of necessity for accelerated tax amortization on new or expanded defense facilities. The 60 day moratorium went into effect August 18, and involves a proposed total investment of $859,606,506.

Among those receiving the certificates were numerous railroads, diesel and tool manufacturers.

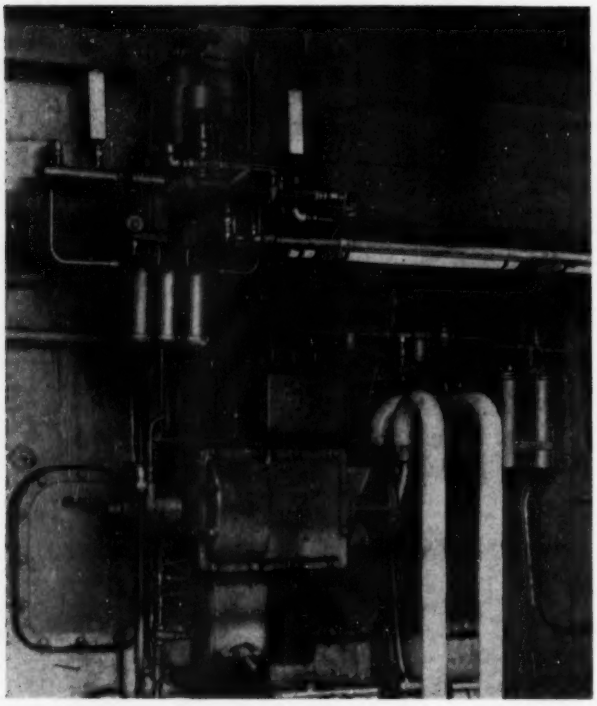
Eight Diesels for Ceylon

Eight diesel-electric locomotives for switching and freight service on the Ceylon Government Railway have been completed by the North British Locomotive Co., Ltd. of Glasgow.

The electrical equipment, main and auxiliary generators, traction motors, and control gear were designed and supplied by GE, Ltd.

Each locomotive is powered by a Paxman Mark 12RPHX vee type 12-cyl. diesel engine, rated at 625 hp. at 1250 rpm.

These units are built for a 5 ft. 6 in. gage track, will develop 35,000 lb. tractive effort and have a maximum speed of 20 mph.



The Diesel Engine and Bunker "C" Fuel

*by Edward B. Rawlins**

For the successful burning of low cost residual fuels in diesel engines consideration must be given to:

Fuel preparation
Operating procedures
Necessary equipment

Economies effected and a typical installation are cited.

RESIDUAL fuels have been used for diesel fuel for some time, as evidenced by the work of John Lamb, the Sun Oil tankers, and the successful operation of a plant at Nantucket, Mass.

More recent applications include installations at the Grove City, Pa. plant of the Cooper-Bessemer Corp. and the Clay Electric Co-operative at Keystone Heights, Fla. (an REA plant).

The use of Bunker "C" or No. 6 fuel oil as fuel for diesel engines presents only the problem of providing clean fuel to the engine at the proper temperature.

However, there are limits within which it is desirable to stay in the selection of residuals for diesel fuel.

The following limits permit the use of approximately ninety per cent of the available American heavy fuels.

A. P. I. Gravity	11	*min.*
Viscosity—SSF at 122° F.	200	*max.*
Conradson Carbon	12%	*max.*
Sulfur	3½%	*max.*
Water and Sediment by a Centrifuge ASTM Method D96-47T	2%	*max.*
Flash	150° F,	*or legal*

The above limits were arbitrarily selected due to the fact that they provided fuels readily available in all major markets.

Fuels of lower gravity and/or higher viscosity than above, present only the problem of more care in centrifuging and cleaning them up and/or the use of more heat to bring them down to the proper atomizing viscosity.

Cleaning the Fuel

Complete removal from the fuel of all abrasive matter and dirt is important if rapid wear and sticking of the fuel pumps and nozzles is to be avoided.

In the design of any system, to accomplish the results wanted, thought must be given to the type and size of equipment that will be operated on heavy fuel. Also, it is necessary to provide spare equipment or equipment so arranged that continuous operation can be maintained.

In the selection of equipment for the purpose of processing the fuel, consideration must be given first to transferring the fuel from the storage or bunker.

In cases where the fuel may have foreign matter of large size, it is advisable to have a strainer on the suction side of the transfer pump. Such strainers can be fairly coarse mesh, and it is suggested that they be two or three times the size that would normally be selected to handle a liquid of comparable viscosity.

Centrifuges are a *must* when it comes to the cleaning of heavy fuels and they should be so sized that they will provide sufficient centrifuging capacity, at sixty per cent of their mean rated output for No. 5 fuel, to maintain full engine operation.

For example, if the rated output of the centrifuge for No. 5 fuel is 225 to 275 gph., then the rate for centrifuging Bunker "C" or No. 6 fuel should be sixty per cent of the mean rated ouput of 250 gph. or 150 gph. It has been found that this rate provides optimum cleaning of the fuel and it is important that this centrifuging rate be maintained within relatively close limits.

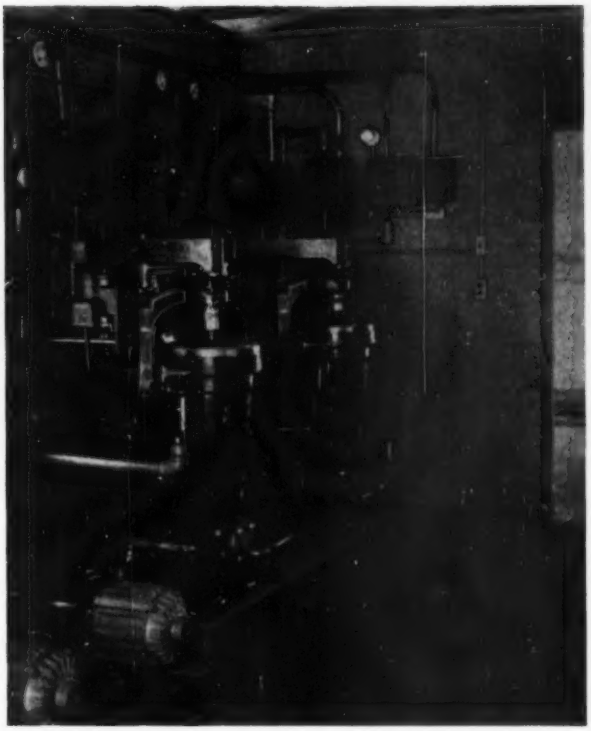
Perhaps in a perfect operation, centrifuging could provide all of the cleaning necessary for satisfactory use of the heavy fuel; but with the human element in any operation plus the fact that the flow through the centrifuge can, for different reasons, vary somewhat, it has been found that filtration of the fuel following the centrifuging operation is a necessary step in assuring clean fuel.

**Engineer, Fuels and Lubricants, The Cooper-Bessemer Corporation*

This is evidenced by the fact that filters in this service do clog and require service. The frequency of this service depends upon, to a great extent, the thoroughness of the centrifuging.

Filters in this service have been found to give from 1000 to 1500 hours and more of cartridge life. Filters of the wound cotton yarn or cellulose (Palconia) have been found to give satisfactory service, although there probably are others that would provide equally good filtration. A point to remember in the selection of a filter for this service is that they must be capable of withstanding these fuels at temperatures up to 300° F.

Finally, filters for this service should be sized fifty to one hundred per cent larger than they would normally be selected for a comparable flow. Sizing filters on this basis provides much longer filter life, lower pressure drop and a low flow rate which improves the efficiency and life of the filter to a considerable extent. High efficiency in the filtering operation provides that much more protection for the injection equipment.



Picture on previous page shows exhaust side of engine with filter, heater, temperature controls, heavy fuel pressure tank, strainer and piping for final processing of heavy fuel before going to high pressure pump.

At right is shown centrifuging equipment in processing house.

Heating the Fuel

Of equal importance with the proper cleaning of the fuel is the proper heating of the fuel. In most locations it is necessary to provide some means of heat in the storage tank so that the fuel can be pumped easily. Heating brings the viscosity of residual fuels down to a point where they may be efficiently centrifuged and filtered and to a viscosity comparable to light fuels to provide proper atomization and efficient injection.

Experience has proved that a temperature of 200°F ± 10°F provides for efficient centrifuging when using fuel of 100 to 120 SSF at 122°F viscosity. The proper viscosity for centrifuging is in the range of 150 to 175 SSU. With heavier fuels, slightly higher temperatures may be required.

There are cases where an excessive amount of water is present in the fuel. Under these conditions temperatures are limited by the boiling point of the water and where these temperatures do not permit sufficiently low viscosities to be reached, centrifuging will have to be accomplished at a lower flow rate in order to gain comparable efficiency.

At temperatures above the boiling point of water, where water is present, foaming and violent agitation of the fuel takes place and it is impossible to handle it in the centrifuge. This only becomes a problem with the more viscous fuels which would require a heat greater than the boiling point of water to reduce their viscosities to the desired levels.

The usual procedure is to discharge the fuel from the centrifuge into a closed vented day tank or make-up tank, then circulate it from this tank through an additional heater, a filter, and then to the header to the engines.

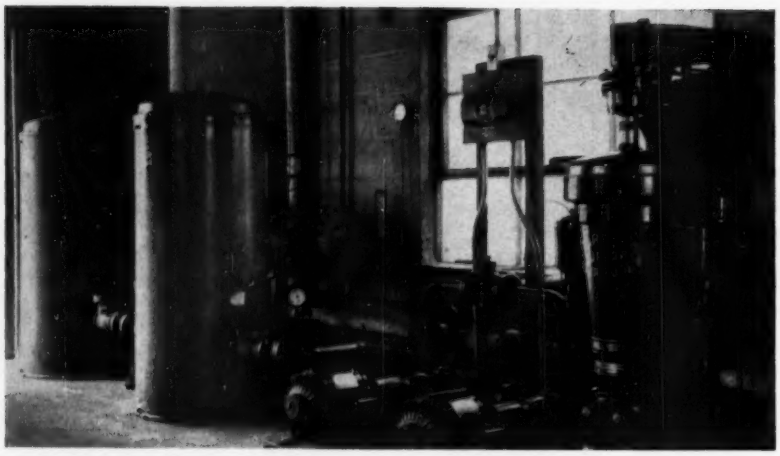
In order that efficient filtering may be obtained and the size of the booster heaters on the engines kept down, the fuel is drawn from the make-up tank and heated to approximately 275°F for circulation through the filters and the system. Experience has taught that this temperature is required for efficient operation and filtering.

It might be mentioned here that, at some lower temperatures, rapid clogging of the filters may be experienced, due to the fact that asphaltines are encountered in an insoluble or non-fluid state and as such will tend to plaster up on the outside of the filters, resulting in their ceasing to function. At higher temperatures these asphaltines become fluid or soluble and readily pass through the filters. Temperatures sufficient to maintain their solubility are necessary.

In most installations a heat loss of 20 to 25° F can be expected in transferring the fuel from the processing equipment through the headers to the engines and for this reason, a small booster heater is installed on the engine to recover this loss. In addition to this heater, an additional small filter followed by a strainer is provided on the engine. The strainer is the last piece of equipment before the fuel goes to the injection system.

Proper operation of the engine and its ability to digest the fuel is entirely dependent upon the viscosity of the fuel at the nozzle. With the rail system the fuel must be fed to the high pressure pump at approximately 275° F to assure a clean running engine; while when the jerk pump system is used, the fuel to the pumps need be only about 260° F.

The reason for this difference is that



Another view in processing house showing filters, secondary heater, circulating pumps and the centrifuges.

a greater heat loss is experienced in the rail system equipment and piping. Various temperatures were tried experimentally with the result that with the rail system a critical temperature is passed at about 260° F and with the jerk pump system at about 245° F.

By critical temperature it is meant that point at which the engine operation stabilizes and the exhaust clears up from a slightly dark exhaust to one that is clear or in some engines very light in color. This transition indicates the change from incomplete to complete combustion of the fuel and the theory back of this phenomenon is that the fuel, due to temperature, has been reduced in viscosity to the point where it permits proper atimization of the fuel.

Running at any temperature lower than the critical temperature produces a dirty exhaust and dirty engine.

About a 15° F margin of safety should be provided above this critical temperature. Further increases in temperature have not been found to provide any improvement in either performance or operation.

As to the hazards involved in handling fuel above its flash and sometimes fire points, it is noted that all fuel at these higher temperatures is handled under pressure and in a closed system, except in the make-up tank which is vented and never reaches a temperature greater than 235 to 245° F.

Were we working with these fuels at temperatures near the autogenous ignition temperature, the operation and handling of the fuels would be dangerous should the fuel, by accident, such as line breakage, come in contact with the air.

Heating of the fuel may be accomplished either by steam or by low watt density electric heaters. Care must be taken to insulate thoroughly all piping and equipment handling the hot fuel, or steam if it is used, not only to conserve the heat, but to safeguard operating personnel.

General

A noteworthy feature of the application of heavy fuel to a diesel is that no change in the engine fuel system or equipment is necessary, either in timing or injection pressures. Merely give the engine its required fuel *properly cleaned* and at the *proper temperature.*

On some occasions, however, it might improve operations slightly to advance the fuel timing a degree or two, but by the same token, the same adjustment probably would improve operation were the engine using light fuel. The engine should and will operate on heavy fuel equally as well as on light fuel without making any change in the engine.

One thing that is generally noticed immediately when switching from light fuel to heavy fuel, is that the combustion is softer and the engine noticeably quieter and smoother operating.

The question may be raised as to how this can be with a fuel at generally poor ignition characteristics or an unknown ignition quality and here again it is theorized that heat is the answer—heat and proper atomization. Proper atomization providing finely divided, properly distributed fuel, and the heat provided assisting in the ignition of the fuel.

It is theorized that the heat provided in the fuel at the time of injection is sufficient to overcome the ignition delay that would otherwise be encountered were the fuel required to get all of its heat for ignition from the heat of compression. The temperature level of 250 to 275°, no doubt, is the determining factor in overcoming the ignition delay of what otherwise would be a slow starting fuel.

Engine Operating Temperatures

Exhaust temperatures are about the same, or possibly a little higher, when running on residual fuels.

Jacket water temperature should be in the range of 175 to 185° F and 170 to 180° F for the lube oil from the engine. Operation at these temperatures or even a little higher gives better operation and improved thermal efficiency. Also, they provide operating temperatures better able to combat the dew point with the result that there is less chance of trouble from sulfur. Operation above the dew point is one way of using fuels of high sulfur, as some sulfur is found in all residual fuels—usually several times as much as is encountered in distillate diesel fuels.

Care of the Lubricating Oil

Contamination of the lubricating oil must be expected, regardless of how good the operation. Due to the nature of contamination in heavy fuels, filters alone are not sufficient. They soon become clogged, with the result that their life is much shorter than would be obtained from the same filters operating on light fuel.

Much of this contamination consists of products which can be readily removed by centrifuging. Experience has indicated the need and advisability for centrifuging in addition to proper filtering in this operation. For this reason, and to extend filter life, it is

A Conservative Estimate of the Total Operating Costs, per Year and per kw of a Typical 10,000 kw Diesel Generating Plant Operating on Bunker "C" Fuel

The following is based on a seventy per cent load factor producing annually 61,320,000 kwh.

	Total	Per kwh
Supervision and Labor	$ 40,000	$ .00065
Bunker Fuel	240,900	.00392
Lubricating Oil	9,500	.00015
Maintenance and Repair	45,000	.00073
Total	$335,400	$ .00545
Fixed Charges per year, Depreciation Total	$ 90,000	$ .00147
Interest	35,000	.00057
Taxes	25,000	.00040
	$150,000	$ .00244
Total for the Year, Operating Costs Plus Fixed Charges	$485,400	$ .00789

recommended that in the burning of heavy fuel a centrifuge be provided to work on the sump continuously. This will maintain the heavy contaminants in the lubricating oil at a low level and assist the filter in proper maintenance of the lubricating oil.

Economics of Bunker "C" as a Diesel Fuel

Residual fuels will effect remarkable economies in the operation of a diesel plant providing it is located in an area where these fuels are available at a reasonable price. Depending on the area, the price of Bunker fuels vary from 4 to 10½ cents per gal. at the present time.

Naturally, nothing would be gained from the use of Bunker fuels where their cost approached the cost of distillate fuels. Therefore, before considering installation of equipment necessary for an engine to operate on heavy fuel, the size of the operation, present and probable future cost of the heavy fuel, and availability should be carefully studied.

To get a better picture of the economies involved, let us take a specific example and use round figures which are not far wrong for some sections, and assume a hypothetical 10,000 kw. electric plant on a 70 per cent load factor and getting 13.8 kwh. per gal. on light fuel. Due to the higher heat content of Bunker fuel we will have a slightly better fuel consumption from the heavy fuel. All things being equal, we should get approximately 14 kwh. per gal. from the heavy fuel.

Now let us take actual fuel costs at Jacksonville, Fla. where bunker fuel is 5.5 cents per gal. and No. 2 diesel fuel is 10.1 cents per gal., giving a differential of 4.6 cents per gal. It is assumed that delivery costs from the terminal to the point of usage are equal for the two fuels.

On light fuel operation, the plant would use 12,100 gal. per 24 hours and at 10.1 cents per gal. the fuel bill would be $1222. Using heavy fuel at 5.5 cents per gal., 12,000 gal. would be used in the 24 hour period and the fuel bill would be $660. A net saving of $562 a day would be realized by the use of heavy fuel or an annual saving of approximately $205,130.

The fuel cost saving per kw. based on the above figures comes out to 3.4 mills.

The estimated cost of equipment and its installation to enable such a plant to operate on heavy fuel would be approximately $60,000. It is readily seen that the savings during the first year of operation on heavy fuel would pay for the equipment and its installation and net approximately $145,130.

Also to be considered is whether or not the operation is of sufficient size to warrant the expense involved. Small single engine installations and intermittent schedules of operation would find that the savings would hardly pay the cost of setting up to burn heavy fuels.

General Maintenance Costs

From the standpoint of engine wear and general maintenance, experience has indicated and is indicating, that with properly prepared fuel and proper operation, wear rates are no greater, if as great, as when using light fuel. General maintenance costs are comparable and there is no reason to believe that operation on residual fuel should increase these costs any.

Blended Fuels

The preceding data has been based on operation on straight residual fuel oils. The handling of blended fuels presents another problem due to the light ends used to cut the heavy fuel. Temperatures required to handle the heavy ends would cause the loss of some of the lighter ends by boiling off.

The writer can see no valid reason for the blending of fuels simply to make them adaptable as a cheaper fuel when the even cheaper Bunker "C" or No. 6 fuels can by proper preparation be efficiently burned in the diesel engine.

The Clay Electric Co-operative Plant

Illustrations of the installation of heavy fuel equipment at the Clay Electric Co-operative Plant, Keystone Heights, Florida accompany this article to show a specific example of one heavy fuel installation.

Also included is a typical diagram illustrating schematically the flow of the fuel through the system generally and the sequence of the equipment installation.

At the Clay Electric Plant they are using a fuel of approximately the following specifications:

Gravity, A. P. I.	*10.8*
Viscosity, SSF at 122° F	*100 to 120*
Sulfur	*0.6%*
Conradson Carbon	*8 to 12%*
Pour Point	*30° to 40° F*
Flash	*220° F*

At this plant, the heavy fuel is picked up at the large storage tank by a 7½ gpm. pump which is controlled

by the liquid level in the make-up or day tank, shutting off when the high level is reached, and is pumped approximately 600 ft. to the primary heater which heats the fuel to 200° F± 10° F from which it goes at this temperature to the centrifuges. Either one or both of the centrifuges may operate at the same time.

A solenoid valve which closes when the pump is down is installed in the line to the heater to prevent heavy fuel from running through the pump by gravity to the processing house, running over, and flooding the place.

A solenoid valve is also provided in the steam line to the primary heater to cut the steam off at such time as the centrifuges are not running and requiring hot fuel.

The fuel is then picked up by a 12 gpm. pump and discharged through the secondary heater from which it emerges at 275° F and from there through the filters into the heavy fuel header in the engine room and thence back through a return line to the make-up tank. Pressure is maintained in the heavy fuel header to provide 28 to 30 psi. in the heavy fuel pressure tank on the engine. This pressure is maintained by a relief valve at the end of the heavy fuel header.

The flow through the engine piping system is from the heavy fuel header to the heavy fuel pressure tank, from the heavy fuel pressure tank through the final filter, from the final filter through the booster heater from which it is discharged at 275° F, through the final strainer and three-way valve to the high pressure pump and the engine fuel system.

Air operated controls are used to control all temperatures.

There is approximately a 20° F loss in temperature between the secondary heater and the booster heater due to the radiation loss of the piping and equipment.

All heavy fuel drips are gathered together and drained back to the make-up tank.

The flow of the light fuel system is the same as is normally used on the engine, that is, from the storage tank to overhead day tanks and from the overhead day tanks by gravity to the suction of the engine driven transfer pumps, thence to the light fuel pressure tank, final filter and through the threeway valve to the high pressure pump.

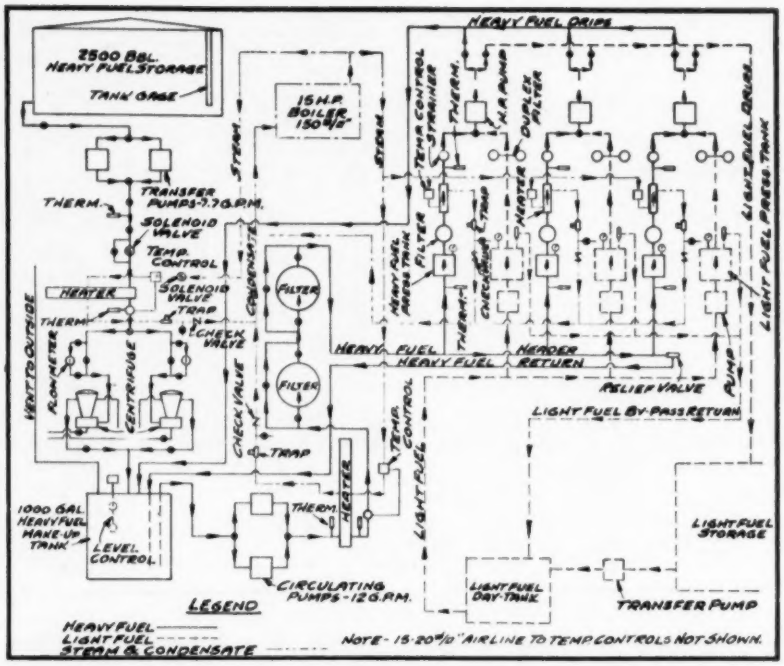
By-pass from the light fuel pressure tank, which is maintained from 28 to 30 psi., is returned to the overhead day tanks.

The heavy fuel pressure tank is equipped with a small orifice to bleed off any air or gas that might accumulate to the drip drain. An additional orifice, to permit a small continuous circulation through the heater, is provided immediately following the booster heater and also returns to the drip drain.

This last orifice permits a continuous flow of hot fuel through the filter piping and heater of the heavy fuel system so as to maintain at all times hot fuel, ready for immediate use in the engine. Heated fuel for the engine is maintained in this manner regardless of whether the engine is running on light fuel or shut down.

The system has been designed to provide heavy fuel for immediate use after starting the engine. In fact, operation on heavy fuel can easily be accomplished within five minutes after starting from a cold start. The writer has witnessed full load operation on heavy fuel from a cold start in less than two minutes.

An engine should always shut down on light fuel to purge the system of heavy fuel and avoid congealing of the heavy fuel in the fuel system. Otherwise, difficulty in starting might be encountered necessitating the dismantling and cleaning of the system before further operation.



Schematic piping diagram for Clay Electric Co-operative illustrates the components and their arrangement as required for heavy fuel operation.

Do You Need Trained Diesel Men ?

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Navy Develops Electric Motor Grease Tester

by George W Grupp

A new electric motor grease tester has been recently designed and built by the U. S. Naval Engineering Experiment Station at Annapolis, Maryland. The new equipment will greatly aid in the testing of greases capable of withstanding the high temperatures necessary for satisfactory performance of diesel and other types of engines in the tropics and deserts, as well as aboard new types of submarines and aircraft.

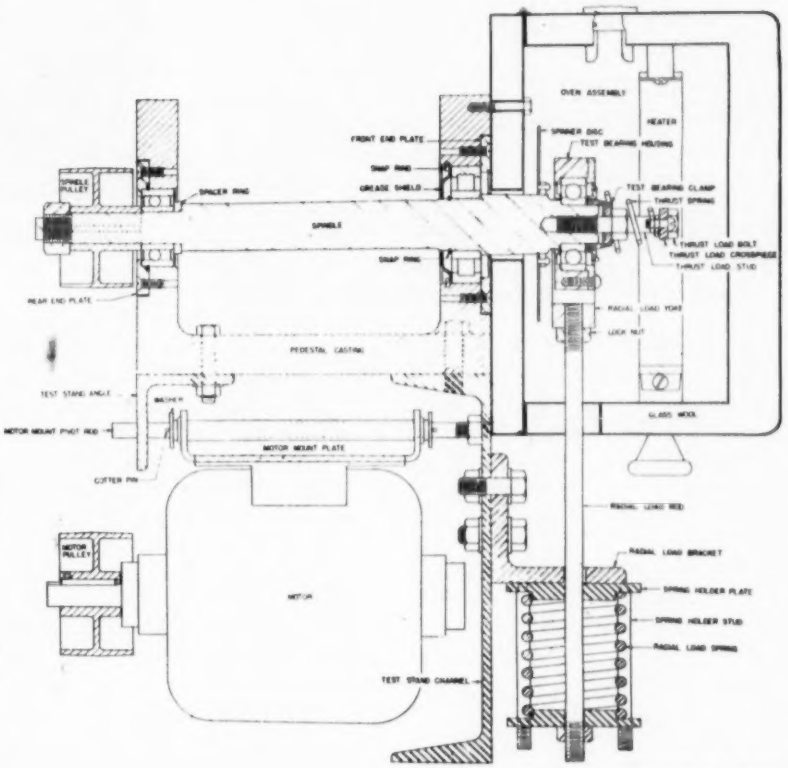
This apparatus, which can even test large bearings operated at slow speeds under heavy loads, consists of thirty individual test units mounted on two test stands with all controls and recording instruments centralized on a control panel. The instrumentation for each unit is complete. In other words thirty different tests can be conducted simultaneously, one with each individual unit.

Each unit, as will be seen from the accompanying drawing, contains a separately driven test bearing in an individual oven with an independent temperature control. The radial and thrust loads are applied by means of springs. These springs provide a wide range of loads. For example, these units can provide radial loads up to 1000 lbs., and they can handle bearings ranging in bore from 30 mm to 60 mm.

Bearings are greased and operated in the tester at speeds and loads simulating engine operation; and the electric heaters warm up the ovens to engine temperatures.

A grease is said to be good as long as the bearings operate within certain prescribed limits of wear. When the life of the grease is exhausted in the tester, an automatic device shuts off the test equipment and the life of the grease is automatically registered.

As the test is underway, the temperature of the test bearing is recorded and controlled with thermocouples by potentimeter instruments mounted on the control panel. In addition, there



Official Photograph U. S. Navy

Sectional view of one unit of the electric motor grease tester. Thirty such units are assembled in two lines with all controls, recording instruments, etc., terminating in a panel.

are mounted on this panel electrical controls for running-time meters, motor ammeters, and motors and heaters.

The motor current is continuously indicated on an ammeter. Motor starters are not placed beside individual motors, instead they are grouped together on the control panel for easy handling. The individual motor power can be recorded with a portable recording wattmeter.

The ovens and temperature controls have been carefully designed to permit test bearing temperatures to range from extremely high temperatures to a low of 2° F.

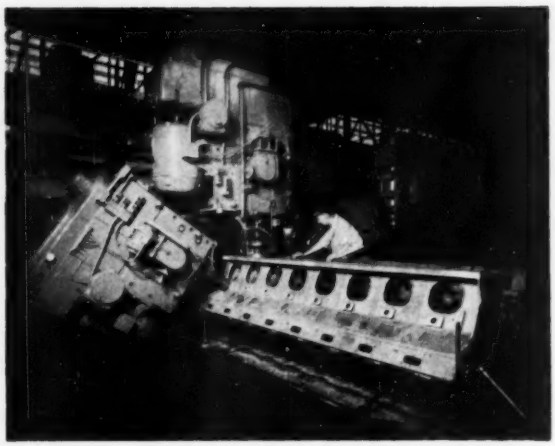
In the past, when tests were made with other designs of testing apparatus it was found that grease failures sometimes occurred on starting after a shutdown and cooling off period. This is explained by the condition that frequently an oxidized grease will be sufficiently fluid for lubrication while at operating temperature, but at room temperature it becomes too hard to permit lubrication during the starting period.

With the aid of this new tester, the Naval Engineering Experiment Station will study this and other problems, correlating the results with all previously collected test data. And since there is a large amount of such data on numerous greases at the Station, this study is expected to give a good indication of which specific formulae are the most reliable.

Economics of various "echelons" of repair and the facilities available as applied to . . . .

Railway Maintenance

Outlining EMD's planned facilities and line of thinking designed to insure continued and efficient operation of diesel-electric locomotives in the critical times ahead.



SCRAPPAGE factors for diesel-electric locomotives up to the present have been negligible. In time, some will reach the point where rehabilitation is uneconomic and then it will be possible to start determining expected life factors. How soon they reach this stage will depend on several factors.

Maintenance will be one of the most prominent of these factors. Included in this general term is the overall system established and the quality of the work performed, both in the field of preventive maintenance and in actual repairs and overhauls.

The Army has a very descriptive method of labeling the various phases of the maintenance picture. First, there are the "1st Echelon" repairs performed by operating personnel. Obviously, this work is spread over the broadest possible base and consists of inspections and minor servicing. Next, come "2nd and 3rd Echelon" repairs, the ascending figures indicating that the type of work in each category involves greater skills and heavier tooling. The work at inspection points on the railroad would be a fair parallel of this class of maintenance.

Fourth Echelon work starts with the heavy overhaul operations and is performed by special units with a concentration of skills and still heavier tooling. This would correspond to the average railroad repair shop. Finally, there is the 5th Echelon, amounting almost to a manufacturing operation. It will be noted that the pyramid becomes progressively smaller as to personnel, more specialized, and with heavier tooling.

This is in keeping with the type of troubles encountered and the frequency with which they occur. The situation of the railroads is reasonably analogous. There are, however, two major points of difference; the Army *must* provide all of the facilities regardless of expense; and, also, *must* provide storage and warehouse facilities for all parts and materials.

Railroads have the option of using other services and facilities to best suit the economics of their particular operation. Experience has shown that practically all railroads can best handle up to 2nd and 3rd Echelon repairs and that the larger ones can frequently justify the maintenance of shops for 4th Echelon work. In general, however, the smaller railroads find it more economical to send this class of work to the manufacturer. Specialized 5th Echelon work is definitely a manufacturer's function.

From the point of view of parts, the inventories that are required to be kept on hand are directly proportional to the service and distribution pattern provided by the manufacturer.

Both of these problems are becoming more acute as the average age of locomotive units increases. The process of dieselization has been so rapid that comparatively large numbers of units will fall due for heavy repair or rebuilding during a relatively short space of time.

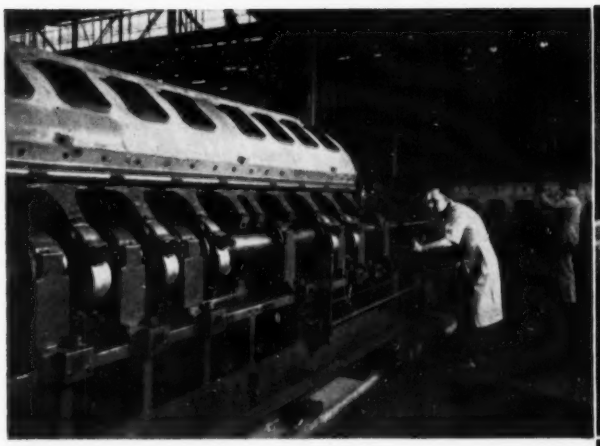
The Electro-Motive Division of General Motors has been greatly concerned about these matters and has taken action. It should be made clear that their preoccupation is with 5th Echelon repairs and with availability and distribution of parts. It was realized that it takes a major investment in tools and facilities for this type of work and that such rebuilding jobs occur at irregular and infrequent intervals. Many railroads are not in a position nor is it desirable for them to undertake such an operation.

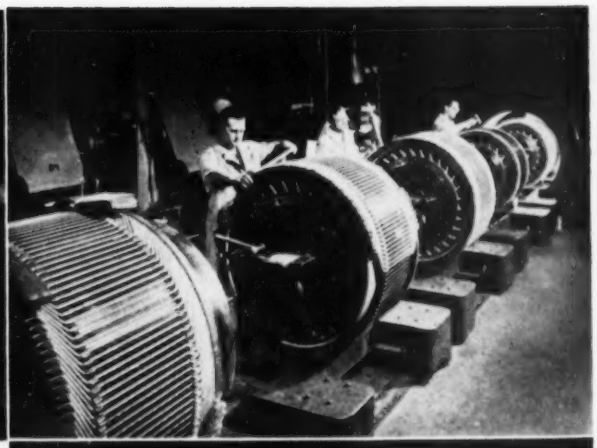
Several years ago in an effort to solve this problem EMD started to build a network of factory branches all equipped with the latest tools and facilities. The idea was to locate them in strategic areas where the work of several railroads could be pooled to create the volume necessary to provide a high plant utilization factor to economically justify the investment.

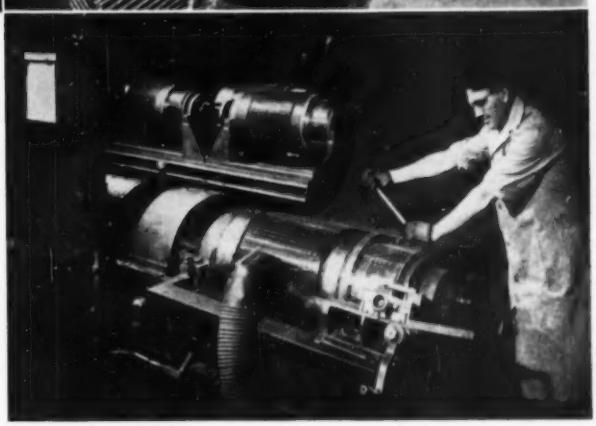
The scope of work envisioned in these factory branch plants is the complete rebuilding of major locomotive components. How does this differ from the work currently being performed in railroad shops? An illustration may clarify the situation.

In the course of a major overhaul in the railroad shop the engine will be completely stripped, all parts and assemblies will be completely checked and either reworked or replaced, and the engine will be built up again. Facilities are available for the reconditioning of the reciprocating parts, liners, heads, etc., but what of the foundation on which all these are assembled—the engine frame.

In the course of time it is entirely possible that distortion may appear. It might affect main bearing alignment or it might lie in the entablature supporting the upper ends of the liners. Even structural failures may occur. Repair is beyond the scope of the







A few examples of "5th Echelon" maintenance. Milling of a 201-A engine frame and align boring bearing bores are typical of heavy engine work. Assembly line rewinding of traction generators and commutator seasoning illustrate electrical phase.

average shop and this engine becomes a project of factory rebuilding.

Actually, it will be found more economic to schedule this type of rebuilding for engines after a pre-determined number of miles of operation. Similar scheduling of traction motors, generators, etc., is also wise. With this type of rebuilding the component is given a new-part guarantee.

The fact that factory standards and techniques are maintained permits a "unit exchange" policy. Components sent in for repair can be immediately exchanged for a rebuilt unit or the customer can elect to wait for the return of his own component. Unit exchange has the advantage of lessening the time involved and hence reduces the inventory required to be on hand for change-outs.

Another important feature of this 5th Echelon repair service is that it offers an excellent opportunity for factory personnel to incorporate modification and design improvements in the course of rebuilding the components. Remanufacture of an early "A" type engine frame, for example, may involve as many as 12 separate modifications to make it conform with current design. The possibility of periodic "up-dating" is another good argument for scheduling factory-type rebuilding at a selected point in the component's life.

Six of these production-line rebuilding facilities are already in operation. They are located at: Emeryville and Los Angeles on the West Coast; La Grange, Ill. and Robertson, Mo., in the Mid-West; and Halethorpe, Md., and Jacksonville, Fla., East Coast.

Along with these facilities are branch warehouses for the storage of parts and exchange units. There are also two branch warehouses in Minneapolis and Fort Worth. This pattern of distribution also has the effect of keeping the railroad's inventory of parts to a minimum.

EMD has gone a step further along these lines by developing a simple and effective stock-record system *(see Diesele Power & Diesel Transportation, April, 1951)* that is currently being used by 13 of the leading railroads. Maintenance of such records serves two very useful purposes; to show accurately the parts on hand and to predict future requirements.

If a manufacturer is to undertake the responsibility of maintaining adequate stocks of parts, it imposes an obligation on the user to keep him informed of his expected requirements. Under current materials controls it is mandatory that parts production be scheduled and the required materials listed. This must be done well in advance. While it is true that most locomotive manufacturers have a pretty good idea of what will be required in the way of parts to keep their locomotives in the field in operation, there are many local circumstances peculiar to a particular operation that may not have been considered.

Railroads are vitally necessary and if there is to be any assurance of continuous operation unhampered by shortage of parts, they must make their needs known in advance. Scheduled maintenance and accurate records are the only reliable basis for predicting usage factors for various parts.

Cooperation between users and builders and the proper utilization of the facilities of each will have a profound effect on the availability factors, length of life, and maintenance costs of locomotive units. If such is done it may be a long time before it is possible to determine the scrappage factors on diesel-electric locomotives.

Winter Conditioning for Crawler Tractors

by Fred J. Shreck

Supervisor of Service, Industrial Power, International Harvester Company

Winter downtime will cost you money unless your crawler tractors are winter-conditioned NOW. Avoid many of those miserable cold weather field repair jobs with a few simple precautions given here.

DON'T try just "getting by" this winter. Start your preventive maintenance program for crawlers at the first opportunity before cold weather sets in.

The strain of low temperature starting and the use of incorrect grades of oil often turns small defects into breakdowns.

Inspect for Oil Leaks and Wash Down

The very first thing to do is check for oil leaks. Look for collections of new oily dirt in odd places. In the case of a dirty engine, look for places where leaking has streaked the dirt. Make the same careful visual inspection of the engine transmission and final drive housing, the sprocket gear and track rollers.

The next step is to clean the tractor and engine—for four basic reasons:

1. Aids proper cooling of engine.
2. Oil leaks show up faster.
3. Decreases fire hazard.
4. Gives operator more pride in his tractor.

Proper engine cooling is especially important in cold weather operation because the lighter winter oils run hotter than heavier oils. The oil film protecting moving parts gets thinner as oil temperatures rise. Therefore, any crankcase dirt pack left on impedes proper cooling of light oils, reducing their lubricating effectiveness.

Cleaning can be done with high pressure hose or steam. However, a two-in., low pressure stream is preferable. Wipe off the bad spots with diesel oil or kerosene. Using low-pressure water eliminates the possibility of damage to any gaskets or seal points.

Lubrication System

In going over the lubrication system for winter, begin at the crankcase. Engine oil gets heavy with use because the light ends of the oil burn off in combustion leaving the heavier base oil. Drain old oil from a thoroughly warmed-up engine, preferably after a days' run.

Cold weather operation causes more condensation and acid fume conditions then occur in warm weather, making it necessary to give special attention to the cleaning of the crankcase breather.

Then flush crankcase with regular crankcase flushing oil—not diesel fuel or kerosene. (Sometimes when kerosene or diesel fuel is used, enough is trapped inside to cause foaming of the new oil when crankcase is refilled.)

Run the engine at half-throttle with the flushing oil for half an hour.

Drain oil filter, wipe inside with clean rags and replace old filter elements with new.

Now refill crankcase with grade of oil recommended by manufacturer for temperature at which tractor is to be operated. Change oil in fuel injection pump, but do not flush.

Transmission, final drive and sprocket drive are next on the list. The lubricants in these units become heavier with use. In fact, if high-viscosity lubricants are left in too long, they will lose good lubricating characteristics and tend to "channel" around the moving parts so that the parts run dry. As these units heat up in use, dirty oil on outside of housing is sucked inside through any seal leaks or the ventilator.

Metal-wear particles also become mixed in lubricant. If there is any doubt of this, magnetize a rat-tail file and stick it in the housing. It will come out covered with metal particles that can cause serious wear.

For these reasons drain the lubricant without fail, even though the unit appears full. Then put in flushing oil, not kerosene or diesel fuel, and run tractor 15 minutes, not under load. Drain or refill in accordance with manufacturer's recommendation.

Next, refill the lubricating gun with the proper lubricant and force old lu-

bricant out of track rollers with new. Follow this with a complete chassis lubrication. Wipe off excess lubricant. It gathers dirt and is sometimes drawn back into lubricated point by heat. This causes rapid wear.

Electrical System

Clean battery terminals with solution of warm water and baking soda, using a wire brush. Dab grease or special paste on terminals and tighten them.

Also check specific gravity of cells with hydrometer. Water level should be brought up with distilled water. Continual low water in battery is an indication of an overcharge condition which calls for corrective action by authorized repair personnel.

Look for worn-out brushes on the commutator and generator armature. Here again, repairs should be made only by distributor's mechanics.

Voltage regulator, started and generator should be checked, tested and adjusted. This can be done effectively only by a qualified mechanic using proper testing equipment. This equipment is portable, however, and can be taken to the job-site by most distributors.

In case of a bad connection or corrosion, voltage regulator would not work properly, causing high voltage and low batteries. Indications of this are continual low water in battery and premature wear of commutator and brushes.

Next, visually check brushes and bushings of starter and commutator.

Combustion System

For fast starts and peak efficiency during winter, there's nothing more important than proper adjustment of the combustion system. Start by cleaning plugs and properly spacing the gap. Check all spark plug wires and connections.

Adjust or replace magneto or distributor points as needed. Clean magneto impulse coupling with kerosene and lubricate with a light oil. SAE No. 10 is satisfactory in most cases.

Don't overlook the air cleaner. It should be removed and disassembled. Wash out with diesel fuel or kerosene. Reassemble and fill with recommended grade of oil, usually the same as that used in the crankcase.

Be sure to check all air cleaner connections to inlet manifold. If any leaks are indicated make necessary repairs.

Diesel fuel filters and water traps shouldn't be passed over. Take them apart and wipe out with clean rags. Otherwise the water and debris will cause a starved condition and reduce engine power as fuel gets heavier with cold.

Cooling System

First of all, check for leaks in the head gasket. To do this, remove radiator cap and fill level with cap. Start engine and run long enough to open thermostats. Accelerate suddenly. If bubbles appear, it is a good indication that cylinder head gaskets leak.

Proper fan belt tension is an item not to be overlooked in a pre-winter check-up.

Also check for leaks in hose and hose connection and water pump packing. Check radiator for leaks by careful visual inspection.

Flush radiator with flushing compound or a solution of baking soda. Leave off radiator cap and run until hot. Drain and flash with clean water. Drain and refill with the anti-freeze called for by manufacturer.

Also check fan belt and fan belt drive pulley for looseness and adjust.

A good way to clean the outside of the radiator is to splash water from a 1-lb. coffee can through the fins with the engine at high idle. The fan will draw water through radiator and suck out a lot of debris that can't be seen lodged between the fins. Caution: There is danger of breaking the fan blades using this method if more water than a 1-lb. coffee can full is used at a time.

Engine Ventilating System

To insure proper combustion and librication, clean the complete engine ventilation system including crankcase breather on side of engine, breather pipe and elbows on top of valve cover. This step is important because these pipes take out condensation which often causes corrosion and failure of valve springs and rocker arms. This is one precaution that is a must. Furthermore, it is recommended that engine ventilating systems be checked frequently during cold weather operation.

Cold Weather Starting Tips

For tractors working and parked for extended periods in cold, it's a good idea to equip them with hood sides.

Avoid parking tractor in exposed place for long periods without running. If necessary to keep it out in winter, run it at least once every day.

In temperatures of 10° F or below, dilute oil in air cleaner and crankcase with kerosene in accordance with manufacturer's specifications.

Fill fuel tanks at end of work day to prevent collection of moisture.

Storing Tractors Over Winter

Store in dry and protected place. Thoroughly wash and clean tractor. Completely lubricate tractor. Drain diesel fuel tank, water trap and fuel filters; open air vents to secure complete drainage. Then close vents. Work flushing oil through the fuel injection system as recommended by manufacturer.

Drain all water from cooling system.

Drain all gasoline from gas tank, strainer bowl and carburetor.

Attach an oil can to an air gun and, using a light oil with rust inhibitor, spray inside spark plug holes, inside the valve cover and all surfaces above oil level. Then spray inside gas and fuel oil tanks.

With these simple precautions, whether you work or store your crawler this winter it will last longer and stay on the job without failing when Old Man Winter's chips are down.

Finger Tip Control for Diesel Oil Rig

by James Joseph

Portable power unit supply up to 2400 hp. to the drill rig at left. Proximity to habitation required the sound-deadening blanketing of rig. Note cooling units with vertical fan discharge in foreground.

A recent drilling operation by Standard Oil Company of California, at Baldwin Hills near Los Angeles, received close attention of the petroleum industry. The reason was a revolutionary new diesel-electric drilling rig, which is designed to be highly portable, and for use on deep wells up to 20,000 ft. as well as for more shallow and routine jobs. While the company made no committments, rumors persisted that the new diesel powered rig might be adopted for operations in Canada's northern oil fields. Seismograph crews have been exploring this region for the last three years.

Standard switched from gasoline and steam powered rigs to diesels to achieve economy and flexibility. To still further improve economy some of the heavier diesel fuels are used.

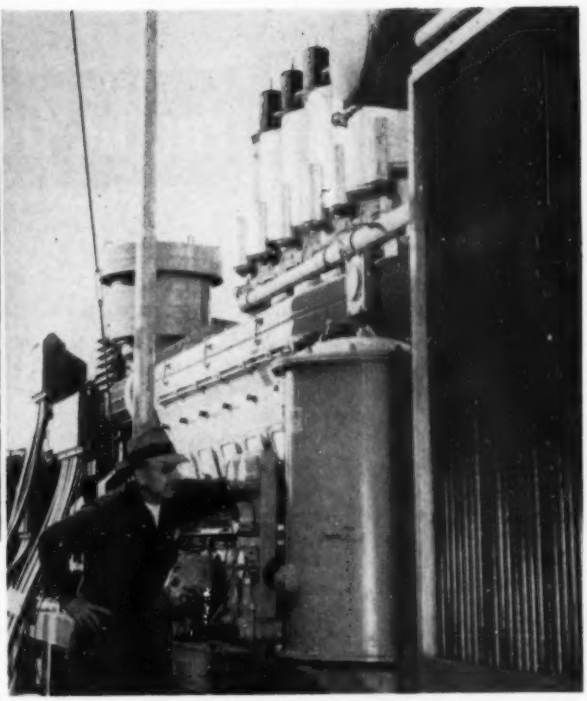
This particular setup is described by the industry as the most "unconventional" ever designed, and consists of two Model 567 GM diesels—1200hp., 2-cycle, 12-cyl. units. Each engine drives three generators—the main and an auxiliary generator being direct driven by the engine and a smaller auxiliary unit driven by vee-belts from the direct-driven auxiliary generator.

To date two test holes have been drilled both of which the company regards as highly successful. Certain "bugs" must still be worked out, but operating characteristics are good and no fundamental changes are contemplated in the rig. At the present time the rig is most efficient when working on 7500- to 20,000-ft. holes.

Compactness and portability is a big point in favor of the new drilling outfit. Although weighing 96,000 lbs., the engine-generator set is skid-mounted and is transported as one unit, except when state highway regulations intervene as to height, weight, and length. In this case it can be broken down into two separate components. All auxiliary engine equipment is included in the package.

Biggest single innovation of the rig is "finger tip control". All controls for various drilling motors being centrally actuated from a control panel. Drillers no longer stand alongside the drawworks, hauling long levers and working foot pedals. A bank of knobbed levers are located in a console before the driller on the drilling floor. This is the central operating point. With finger tip control, drillers are able to effortlessly control the hundreds of diesel supplied horsepower; brake the descent of tons of casing going into the hole, control pressures and flow of mud. Basis for the finger-tip controls are amplidyne control systems which grew out of World War II. Amplidynes limit torque on the motors, and can be pre-set to limit power delivered by the generators. Direct current motors used throughout

Power for all drilling functions is "finger-tip" controlled at the console shown above. Speed and torque of all electric motors is accurately controlled.



At right is a close-up looking down the side of one of the power units. Seen, right to left, are portion of radiator, lube oil filter, instrument panel, air cleaner, and generator cables. Note multiple exhaust silencers.

An overall view of the drilling rig with its quilted layer of blanketing. Power units are at right. Control of noise intensity has been very successful.

the rig provide smooth and rapid acceleration of loads, with absolute control of speed and torque.

In operation of the rig, either of the two main generators drive a 765-hp. mud pump motor, and either of the direct driven auxiliary generators can drive the rotorary table motor. When hoisting, the two main generators are paralleled to drive the 1500-hp. drawworks motor. With a total of 2400 horsepower on this rig it has nearly 50 per cent more than that of the average heavy drilling rig.

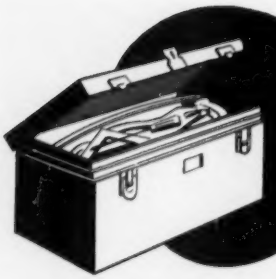
With this new equipment, Standard expects to undertake the exploration of deeper frontiers of possible oil-bearing strata more easily and economically than ever before. This from a company with world wide operations is no small recommendation for big diesel-electric rigs.

The rig was designed, manufactured and assembled by Emsco Derrick and Equipment Company from ideas supplied by Standard of California engineers and by consultant J. E. Lucas.

Recently, when the rig was tested in the Baldwin hills, Standard engineers designed special sound deadening devices because of nearby homes. The 150-ft. tall rig was tightly covered with heavy canvas quilting, stuffed with strips of sound-deadening material. Placed around all engines and generators were walls of the same material. In addition the motors were equipped with silent chain drives. This experiment, in a populated area, was termed "successful" by Standard. With the rig in full operation only a distant drone was heard, with an occasional muted clank from the drilling floor.

This might be a good idea for other drillers and for diesel plants near populated centers, especially where diesel noise has been objectionable.

Meanwhile, the petroleum industry is watching the new diesel-electric rig—especially its adaptability, economies, and finger-tip controls.



Straight from the Tool Box

This is YOUR Department. Pass along your ideas to the other fellow. Send items to the Editor, preferably with a picture or sketch. Contributors will receive $10.00 for each item upon publication.

This presentation inaugurates a new feature that will appear each month—we hope! Obviously, its success and continuation depends on the willingness of our readers to pass along the benefits of their ideas and experience. Shoot in your entries so that we can get started. Let's hear about how you solved a t oublesome problem, your time and money-saving shop kinks, and some of those pet "how-to-do-it's" that you have worked out. You have asked for it and here it is. Now, let's keep the ideas circulating.

Checking Pole Piece Connectors

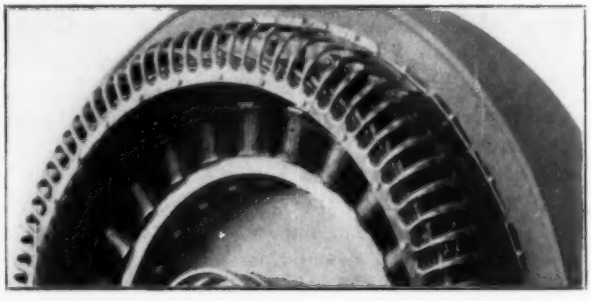
Tom Moore, Lowell, Mich.—Few plants today have enough firm capacity to stand the loss of output from one of the generators. Many plants have probably had the same experience that I have had and have unexpectedly lost their load due to the failure of a connection between two pole pieces of a generator. This usually happens during periods of peak load when the generator is pulling its full load and, maybe, then some.

All of the jumpers are in series so when one goes "open" there is no field exitation and the generator is out of business. You wouldn't think that these jumpers would give trouble and most of the time they don't. When they do, it is just when you need the generator the most. A combination of thermal stress (possibly overloads) and mechanical vibration is usually the cause of the trouble.

I have made it part of the routine testing, such as the use of a "megger" on insulation, to check these jumpers. Then, when one is found going bad it can be changed at a slack time. It took a while to find an instrument that was sensitive enough to tell me what I wanted to know. It had to be an Ohmmeter that would accurately measure low resistances. The "Ducter" manufactured by the James G. Biddle Company of Philadelphia was found suitable.

Most of the jumpers are either of twisted wire or laminated strip construction. I found the resistance of a good jumper and used this as a guide. It was then possible to take readings and in several cases a single broken lamination or wire was detected and the jumper replaced before an outage was encountered.

Illustrating the jumpers connecting pole pieces.



An Idea for Torquing Bolts

Jack Atkinson, Dallas, Texas—During the last ASME Oil and Gas Power Conference, I sat through a lively discussion about the best ways to get bolts to the proper tension. They talked of torque wrenches, measuring elongation and all the other ways of setting them up. One thing mentioned was that the difference in friction between bolts, particularly when new, gave inaccuracies even when a torque wrench was used. I have a little "kink" that I have been using with good results and I thought you might want to pass it along in case it is new to some of your readers.

I usually run the nut down on the thread and then get a good long wrench and really lean on it. In most cases the nut is run down further than normal. The nut is then backed off and set up to proper tension with a torque wrench. What actually seems to happen is that the nut burnishes the threads slightly beyond the location for the proper torque setting. After the threads are polished in this way, the friction seems to be about the same on all the studs and the tensions are more uniform. It is a little more trouble, but I think it is worth it.

(Mr. Atkinson has hit upon a method of tightening that has some merit. While this practice is not too common, it was observed in use at the Cummins plant. When installing crankshafts, caps were tightened using a long-handled wrench. They were then loosened and properly torqued. It is particularly applicable in the case of new studs and nuts, as mentioned. A word of warning—Don't go too far in the preliminary tightening to where the bolt is permanently stretched. Get the "feel" of the proper torque and then go just a little further.—Editor)

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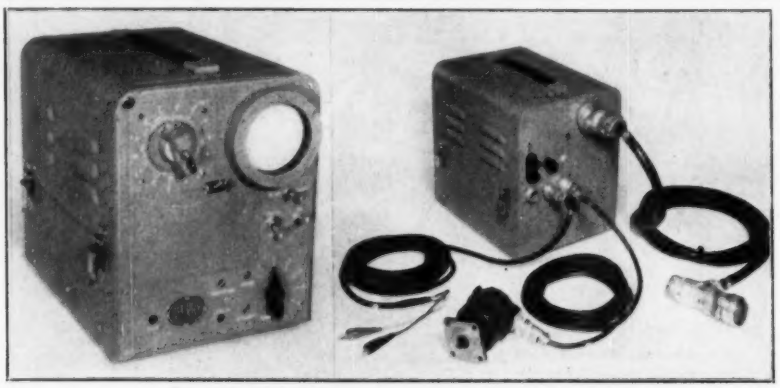
New Products



Portable Electronic Engine Analyzer for Spark Ignition Engines

Illustrated above are two views of a portable engine analyzer which electronically detects, locates, and identifies detailed ignition and mechanical troubles in gas and other spark ignition type engines. At left is a preproduction model of the type now in production at the Sperry Gyroscope Company, Great Neck, N. Y. Back of the instrument is shown with the connections (left to right) being: line power; engine timing generator; ignition system information.

A cathode ray tube screen on the analyzer shows the internal operating condition of the engine while running. It warns of cylinder and accessory failures such as bad spark plugs, sticking or damaged valves, and preignition, before they are serious.

A simplified version of the engine analyzer used so successfully in multi-engine aircraft, it incorporates a number of important features. Principal of these is a new timing adjustment which makes setting of the timing generator on the engine unnecessary. By turning a panel knob, the operator can synchronize the analyzer accurately to any angle of the engine's rotating crankshaft. Other features are:

1. Cathode ray pattern is calibrated in deg. of engine crank angle. Calibrations are read on a continuous dial of the "cycle selector" control which moves the cylinder events across the screen, telling exactly when a particular event is occurring in terms of engine cycle time.
2. A new electronic sweep length control keeps the calibration of the cathode ray pattern constant regardless of the engine's speed.
3. Replaceable dial plates which index cylinder numbers, firing order, and firing times on the "cycle selector" calibrated scale are provided for standard engines.
4. A new switch for making the screen show one or more reference markers which are timed to a fraction of a degree to any particular crankshaft position.

Weighing less than 27 lb. and having modest dimensions, the analyzer is applicable for use on the engine itself, engine test stands, as well as in engine and fuel laboratories.

Drilling and Tapping Machine

Kaukauna Machine Corporation announces a new horizontal drilling and tapping machine to drive boring fixtures and perform drilling, reaming, boring, counterboring, tapping and spot-facing operations at high feeds and speeds.

The box type column is heavily ribbed and the 4-in. diameter flame-hardened spindle with 42-in. spindle travel slides in a hardened steel sleeve mounted in precision Timken taper roller bearings. The spindle drive motor may be from 16 hp. to 20 hp. and the spindle is fitted with No. 5 or No. 6 Morse taper with 18 speed changes through sliding gears actuated by a direct reading rotary dial selector lever.

Controls are grouped at the front of the headstock, the pilot wheel is internally clutched, overload protected and graduated to 6 in. for depth control drilling and tapping with automatic feed kick-out at the pre-selected depth. Headstock is completely counterweighted and has rapid traverse and electric inching through a power driven screw with the head traverse motor located on the sheave bracket. Traverse rate is 80 in. per minute and overtravel is prevented by limit switches.

Air Screw Drivers

Ingersoll-Rand announces a line of cushion clutch air screw drivers in three basic sizes for general manufacturing operations.

The cushion clutch construction consists of two units—an engaging clutch and a torque limiting clutch. The engaging clutch enables the screw driver to be moved from screw to screw without stopping the motor—since slight forward pressure on the tool is necessary to rotate the bit. The ball-type torque limiting clutch permits adjustment for precise torque control, and enables the operator to drive all screws to the same degree of tightness. In addition, these cushion clutch screw drivers have adjustable exhaust deflectors, which permit operators to direct the exhaust air as desired.

The screw drivers are available in Series 000 for driving small screws up to No. 8 free-running or No. 5 self-tapping; Series 00 for medium screws up to ¼ in. free-running or No. 10 self-tapping, and Series 0 for large screws up to 5/16 in. free-running or ¼-in. self tapping. Reversible and non-reversible models are made in each Series, and the two larger Series

can be had with either straight or pistol grip handles. Thirty-eight sizes are available for all speeds and capacities.

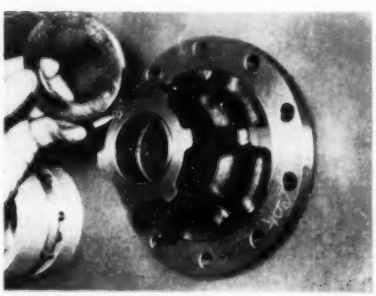
New Screwstarter

A new 2½-in. size screwstarter has been introduced by Herbrand Tools of Fremont, Ohio. Its small size is particularly useful for under the dash electrical and radio and other hard-to-get-at screw starting jobs.

It is claimed that the powerful spring tension will hold up to 15 lbs. pull on screw. Automatically releases when screw is driven tight.

Pressed Fit Pin

An all-purpose pressed fit pin, called "rollpin" is now being manufactured by the Elastic Stop Nut Corporation of America. It is designed as a replacement for the variety of dowel, pivot, tapered and grooved pins most of which require secondary fastening devices. The manufacturer claims that it has a high-pressure, shake-proof fastener that eliminates expensive hole-reaming operations. The fastener is a piece of metal rolled into the shape of a cylinder with a gap or slot which par-



allels the long axis of the hollow cylinder. The "rollpin" is oversize in relation to standard drill sizes, and both ends are chamfered, or beveled, so it can be readily driven into a hole drilled within normal production tolerances. The slot permits compression of the cylinder as the pin is driven in. The resulting tension, caused by the constant pressure exerted by the "rollpin" against the hole walls, secures it in position against extreme vibration and shock.

New Metallizing Guns

Two new metallizing guns have recently been announced by Metallizing Engineering Company, Inc. The new guns, type 4E for machine element work, and type 5E for corrosion protection coatings are said to develop the highest spraying speeds yet available in guns designed for hand-held operations, and to provide the nearest thing to automatic operation, since they incorporate a jet

siphon principle in the gas head which automatically compensates for

(*Continued on page* 61)

here's an "EYE"

that never leaves the gauges

Like a hawk . . . every second, day and night . . . the PENN Safety Control "watches" the gauges so that overheated cooling water or oil pressure failure can't cause damage to your engines!

At the first sign of engine overheating or lubricating oil pressure failure, the PENN control *automatically* gives the alarm . . . rings a bell, flashes a light or shuts off the engine. Then you can investigate and correct the fault before damage occurs.

Learn more about this *low-cost, positive protection.* A few dollars invested in PENN Safety Controls will give you thousands of dollars worth of dependable protection for your engines. Write for Bulletin E-100 which fully describes the three basic models . . . oil pressure only . . . water temperature only . . . combination pressure and temperature. **Penn Electric Switch Co., Goshen, Ind.** Export Division: 13 E. 40th St., New York 16, U. S. A. In Canada: Penn Controls, Ltd., Toronto, Ont.

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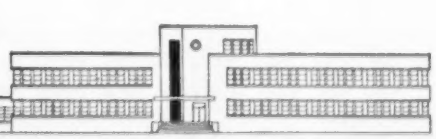

AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, PUMPS, AIR COMPRESSORS, ENGINES, GAS RANGES

Preparing Fuel for Pipeline Engines

(Continued from Page 41)

made at various points in the fuel system to determine the effectiveness of the centrifuge and filters.

Quite often we have found it advantageous to place a filter in the fuel line at the engine just ahead of the fuel pumps to trap iron sulfide particles that form in the iron pipe fuel lines and headers. This condition exists if the crude being used as fuel contains an appreciable amount of sulfur. To eliminate this iron sulfide dust, which is very destructive to the close clearance injectors and nozzles, we have in the last few years fabricated our fuel lines and headers of copper or brass pipe.

Another problem that is troublesome, is the formation of rust, iron sulfide, and water in the outside storage tank containing the centrifuged crude. The accumulation of moisture is very noticeable in cold weather when the tank is cold and the warm crude from the centrifuge is pumped into it. The presence of sulfur causes corrosion on the steel tanks above the fuel level and rust and products of corrosion are continually sluffing off the tank roof and walls into the fuel.

We find it helpful to clean these tanks about once each year. The use of a stainless steel, brass, aluminum, or wooden tanks for clean fuel storage would be helpful, but possibly we could eliminate this trouble by pumping the fuel from the centrifuge directly into the day tanks located inside the station.

Equipment and Training

In the preparation of fuel the proper equipment such as filters, centrifuges, and purifiers is very necessary, but equally important is the proper care and maintenance of this equipment. We have found from years of experience that the quality of the fuel we burn and the performance of our engines is dependent, to a great extent, upon the constructive efforts of our operating personnel.

If these men who are entrusted with the care and maintenance of the filtering equipment are given a schedule of regular maintenance, and are conscious of the importance of a perfectly clean fuel, then our fuel is usually good, our shut-down time held to a minimum, and our overall operations improved. An educational program covering proper fuel preparation plus the necessary equipment for proper cleaning will pay off in any plant that is troubled with excessive maintenance resulting from dirty fuel.

We have tried to point out the importance of properly preparing the fuel for our engines, and much could be said about properly preparing and maintaining the engines to burn the fuel, for both are important in the maintenance of our equipment. We have found that constant checking of engine compressions and expansion pressures is required in maintaining efficient engine operation.

I have not covered the subject of fuel preparation of duel-fuel engines, but feel that it is a combination problem concerned with preparation of diesel fuel and natural gas, so that they are suitable for good engine operation.

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Clutch Engineering Help
for Transmission Designers
Whether your transmission problem involves a single or double plate or multiple-disc clutch, a power take-off or a speed reducer, the ROCKFORD engineering staff will contribute over a quarter century of successful clutch application experience toward its practical solution. Thousands of design engineers have utilized this help to fit maximum torque with minimum bulk and weight into compact product designs. Just write or phone for this ROCKFORD field engineering service.
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ROCKFORD CLUTCHES

New Products

(*Continued from page 59*)

variations in gas pressure as high as 10 lbs., and provides a steady flame. They also have an automatic control of wire feed.

The type 4E gun is designed to spray all wires from 20 B&S gauge to 1/8 in. in any metal. The type 5E is designed for high speed spraying of the softer metals, such as zinc and aluminum. It sprays 3/16-in. wire and will deposit as much as 55 lbs. of zinc per hour; aluminum 15 lbs. per hour. The guns may be mounted for use on a lathe or other machine in production line work, or may be used in hand-held operation, since they weigh only 4 lbs., 12 oz.

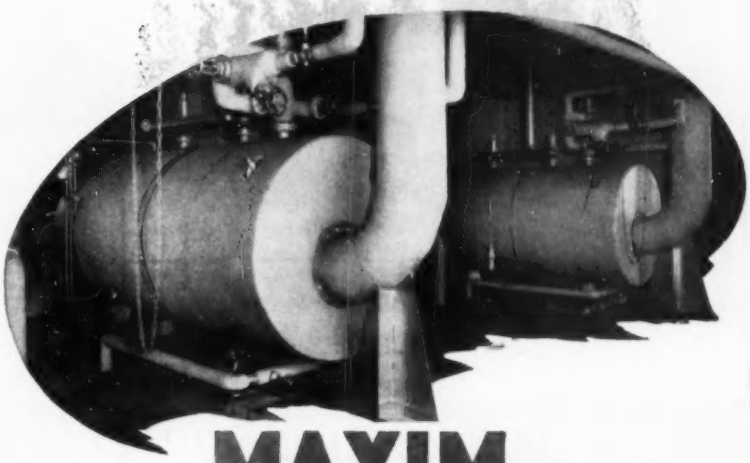
3000-Watt Diesel Electric Plant

A new 3000-watt diesel electric plant, powered by an air-cooled full-diesel engine, is announced by D. W. Onan & Sons, Inc.

Simplified plant design makes for easy operation and servicing of this Model 3DSP-1E diesel unit. Push-switch control for electric cranking, manual compression release, and an electrically heated glow-plug for cold weather starting are provided.

The 4-cycle single-cylinder diesel engine incorporates many new engineering features that have increased power output and operating efficiency. Operating economies of approximately 0.155 gallon of low-cost furnace oil

IS WASTE HEAT WASTING YOUR MONEY?



MAXIM

HEAT RECOVERY SILENCERS CONVERT WASTE EXHAUST HEAT TO USABLE STEAM or HOT WATER

A big Los Angeles Sewage Disposal Plant found that Maxim Heat Recovery Silencers provided all the steam necessary for plant heating as well as heating the sludge — *and from exhaust heat that would otherwise have been wasted.*

Perhaps your own operating expense picture can be improved by this simple and effective way to provide extra steam or hot water for heating or processing operations while at the same time effectively silencing exhaust noise. Our engineering department will be glad to make recommendations.

Automatic Controls

In figure E water is low and there is less *effective heating surface* (heating surface in contact with water), hence lower steaming rate.

In figure F water is high and gives greater effective heating surface — higher steaming rate. Steam pressure regulated valves control the amount of water to produce desired steam capacity.

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LEADING DIESEL ENGINES HAVE *Manzel* FORCE FEED LUBRICATORS

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A Fulton type KS Diesel equipped with Manzel Model 94 Lubricator

Manzel Lubricators supply the *exact* amount of oil needed at each wearing point, reducing oil consumption as much as 90%.

They are furnished as standard equipment on leading makes of engines, and machinery. Or they can be installed on your present equipment.

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Why it Pays to Select Manzel Lubricators

- THEY LENGTHEN THE LIFE OF MACHINERY
- THEY ARE AUTOMATIC AND TROUBLE-FREE
- THEY ELIMINATE "DOWN TIME"
- THEY CUT OIL CONSUMPTION UP TO 90%

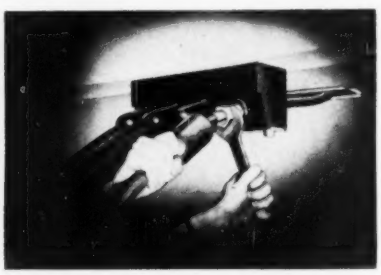
Manzel 271 BABCOCK STREET BUFFALO, NEW YORK

per kw. hr. at full rated load have been achieved.

The unit generates 115-volt, 60-cycle, single-phase current. Other ac. models available in single phase produce 230 volts and 115/230 volts. A 32-volt battery charging model can also be supplied. All models are conservatively rated to provide ample overload protection.

New Traction Motor Connectors

Change-out of traction motors on diesel units can now be greatly speeded up with a saving in labor and materials by use of the new Williamsgrip Connectors, according to its manufacturers, the Paxton-Mitchell Company.

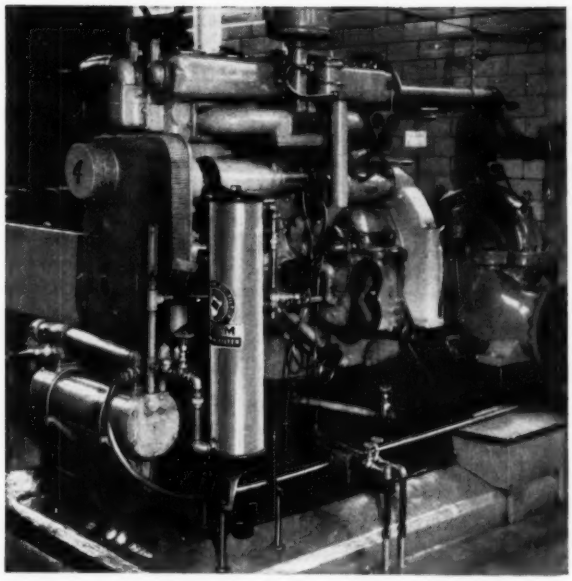


Due to the design it is claimed that taping and untaping cables and the maintenance of glad hands at every change-out is no longer necessary. In addition, only a ¼-in. turn of the buttress thread nuts are required to tighten cable connections.

The connectors are so designed to assure equal contact pressure over the entire mating surface of each connector and also provides for a tensile pull of 1500 lbs. Another important feature, according to the company, is that connectors which become damaged may be renewed without replacing the complete block.

New Waterproofing Material

A new waterproofing compound for subterranean structures has been placed on the market recently. Known as Coprox, the new material is manufactured by Coprox, Inc., and has been under test by several companies for sometime. It is claimed by the makers that all water seepage troubles were eliminated in every case. The new product is cheaper than many superior



Fram Filter Installation on Murphy Diesel at New London, Conn., Waterworks

FRAM Filters Assure Dependable Diesel Operation at Pumping Station

PUMPING STATION Supervisor Walter F. Mahoney says words cannot express the excellency of Fram Filters. This station operates 24 hours a day, 7 days a week, pumping water from reservoir into large storage tanks which supply New London, Conn., with water. Reliable operation is vital. Without it, the city would be without water. Fram Filters remove sludge, grit, abrasives and other impurities from lubricating oil, prolong engine life, cut down-time and maintenance costs.

FRAM Filcron Filters Do the Job Better!

- ***Remove solid and abrasive contaminants 1 micron (.000039") and larger***
- ***Minimize Engine Wear***
- ***Reduce Engine "Down-time"***
- ***Extend Engine Life***
- ***Lower Operating Costs***

No matter what your Diesel oil filtering problem—either lube or fuel—Fram can help you conquer it. Write for full information today to:

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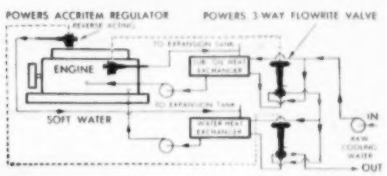
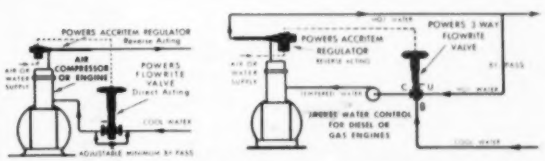
Unsurpassed for reliability and power to operate large or small size 3-way or 2-way diaphragm valves for accurate control of jacket water and lube oil cooling temperatures.

IMPORTANT ADVANTAGES

- ***Adjustable Sensitivity*** and over-heat protection.
- ***Calibrated Dial*** temperature adjustment.
- ***Simple, Rugged Construction*** withstands vibration and insures many years of reliable service.
- ***Temperature Ranges*** 50 to 250° F. and 150 to 350° F.
- ***Easy to Install.*** Requires 15 lb. supply of compressed air or water for its operation.
- ***Small Size***—regulator head is only 2⅞" x 3⅝", sensitive bulb is 12" long with ½" I.P.S. connection.



Only a few of many possible applications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JACKET WATER CONTROL FOR DIESEL OR GAS ENGINES

POWERS FLOWRITE DIAPHRAGM VALVES controlled by Powers ACCRITEM Regulators provide an unbeatable combination for better control and lower maintenance.

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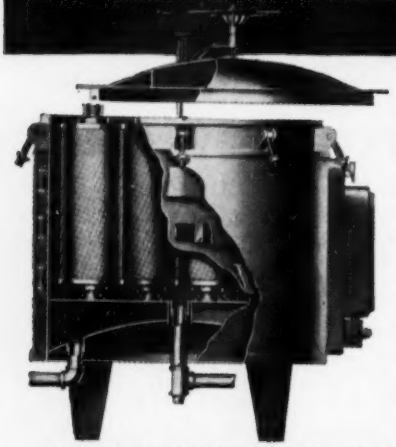

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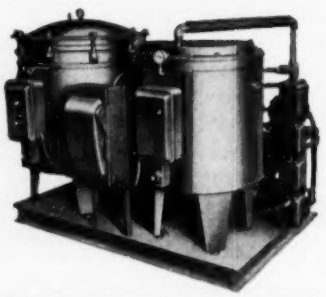
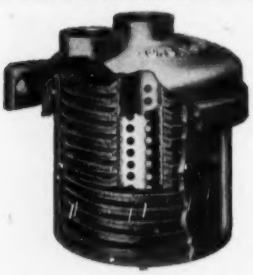
As buyer or builder of diesels, it will pay you to get complete details on the Hoffman filtration line. Literature and data are yours for the asking—TODAY.

HOFFMAN CARTRIDGE FILTERS FOR DIESEL FUEL AND LUBE OIL.
Feature a new high in modern, efficient design. An exclusive cover-lifting device simplifies cartridge removal. Swing bolts fasten the cover — assure quick, easy cartridge replacement. Available in two series, for either 7 x 18 Navy size throw-away cartridges in multiples of 1, 2, 4, 7, 9, 14 and 18 cartridges. Or, for 11 x 18 cartridges, either re-packable or throw-away types, in multiples of 1, 2, 3, 4, 6 and 8 cartridges. Provide continuous clarification on shunt or by-pass basis. With or without heaters and controls.

COMPLETE PURIFICATION OF USED LUBE OIL IN THE HOFFMAN OIL CONDITIONER
Save yourself the high maintenance cost of centrifuges. Removes both insolubles and solubles (oil, gas, moisture, fuel dilution). Only two moving parts . . . no steam or water connections. Models with capacities from 25 to 600 g.p.h.





HOFFMAN DISC FILTER
Three sizes of this compactly designed filter to handle 1 to 10, 5 to 50, and 50 to 125 gallons per minute. Removes impurities from 3 to 5 micro inches. Low first cost . . . no moving parts . . . minimum maintenance.

WRITE NOW for Descriptive Bulletins

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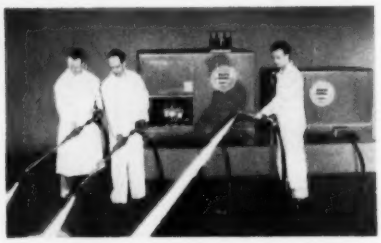
U.S. HOFFMAN MACHINERY CORPORATION
214 LAMSON STREET, SYRACUSE 6, N. Y.
CANADIAN PLANT: CANADIAN HOFFMAN MACHINERY CO., LTD., NEWMARKET ONT.

paints, is brushed on, and sets to a china-like finish.

Heavy Duty Cleaning Unit

Production of what is claimed to be the highest volume steam cleaning unit made in America is announced by



Kelite Products, Inc. Known as the "Power Master Unit," this compact machine is designed especially for heavy-duty cleaning in industrial maintenance, construction, petroleum, automotive, marine, and railroad cleaning operations.

New Literature

Construction Brochure

The Winger Construction Company of Ottumwa, Iowa, has recently announced a new 20-page brochure. This book contains full page photographs and color illustrations showing projects carried on by the firm. Included are power plant and industrial plant piping, equipment installation and buildings. Particular attention is paid to construction and equipment in the electric power plant field.

Fusion Welding Booklet

A new, 44-page booklet on the fusion welding of nickel and the high nickel alloys has been published recently by The International Nickel Company, Inc. It includes more than 30 tables and almost 50 drawings and photographic illustrations.

The booklet covers various forms of electric arc welding as well as gas welding. There are over 20 chapters and sections covering, in addition to detailed welding instructions, such information as the boiler code of the ASME, pickling, testing and inspection safety methods and associated topics.

Tube Fitting Catalog

The Crawford Fitting Company has issued the Swagelok tube fittings catalog which describes and illustrates the complete line of leakproof Swagelok tube fittings which are available in brass, aluminum, steel, stainless steel, and Monel.

Complete dimensional information, cross section drawings, installation, recommendations and assembly instructions are included.

New Miniature Catalogs

South Bend Lathe Company has issued two new catalogs of postage stamp size, one describing practically the entire line of precision machine tools and the other the line of attachments and accessories for the lathes.

Only 2½ by 1⅝ in., each of these accordion folder catalogs contains 28 pages with clear cut illustrations and highly legible type matter. They were developed for the purpose of enclosing with each item packed for shipment, no matter how small.

Shell Molding Booklet

"What You Should Know About the New Shell-Molding Process" is the title of an 8-page booklet which The Borden Company's Chemical Division has just brought out. It traces the development of shell-molding from its beginning in war-time Germany, and explains its uses and advantages.

The process calls for a dry sand mixture containing special phenolic resins. A shell about 3/16 in. thick is produced by dumping the mixture against a hot metal pattern for four to six seconds, then oven-curing the resin for about 20 seconds to four minutes. The mold halves are made ready for pouring by being clamped together or placed in a box and supported with metal shots.

Shell-molding is now being extensively used in automotive, marine and aviation castings; tool; plumbing and heating fittings; pressure pipe; and ordnance and ornamental work. Among the advantages claimed are precision casting at green sand casting costs, greater production, less space needed because the molds are turned out

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to the men... to the shop

Your tool dollars can't buy safer, tougher, faster tools than Snap-on Heavy-Duty *Professional* Tools! They'll take more punishment and deliver more service—as thousands of engineers and mechanics can certify. They're money-makers—keep a mechanic's productiveness up and cut plant down-time for double dividends. Direct service to industry everywhere through 41 factory branches. The Snap-on Industrial and General Catalogs belong in your files, where you can reach them quick! Write—

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faster, savings in metal, sand, sand-handling and sand-conditioning costs, less labor and particularly less skilled labor, and suitability for casting all metals.

The pamphlet gives detailed information on what equipment and materials to use in shell-molding, specifies the proper temperatures and explains how such possible pitfalls as over-curing, excessive moisture and inadequate mixing can easily be avoided.

New Motor Bulletins

Data on ratings, construction and types of large Allis-Chalmers vertical induction motors are contained in a new bulletin released by the company.

Widely used for pumps and other vertical drives, vertical solid shaft induction motors described in this bulletin are available in ratings upwards from 60-hp. at 200 rpm. Except for bearing arrangement, mechanical construction of the motors is basically the same as that of horizontal units.

The standard construction features of their low speed, coupled-type, pedestal-bearing synchronous motors are described in another new bulletin released by the company. The features described are available in the pedestal-bearing synchronous motors in ratings of approximately 100-hp. and larger at speeds of 450 rpm. or less. Motors of 1.0 power factor or 0.8 or better leading power factor are available.

Heater Folder

Edwin L. Wiegand Company has recently issued a folder covering their complete line of "packaged" heaters—immersion, circulation, and other heaters that have built-in controls.

These ready-to-operate heaters are used in the chemical, petroleum, and related industries. Some typical applications are: preheating oil and water; melting soft metals and heating viscous fluids.

Directory of Steel Foundries

Most up-to-date information available on steel foundries in the United States, Canada, and Mexico is incorporated in a new reference volume, Directory of Steel Foundries, compiled and published by Steel Founders' Society of America.

The 208-page directory for 1951 includes separate sections covering detailed data on individual foundries in each of the three countries. Supplementing complete lists of all such steel casting facilities are informational breakdowns on personnel, production equipment, types of castings produced, capacities, trademarks, and related data.

Producers of heat and corrosion-resistant castings, high manganese, investment mold, and tool steel castings are listed along with all known producers of carbon and alloy steel castings of varied types. Of especial usefulness is a concluding section comprising a comprehensive index of the U. S. steel foundries, listed alphabetically, by states.

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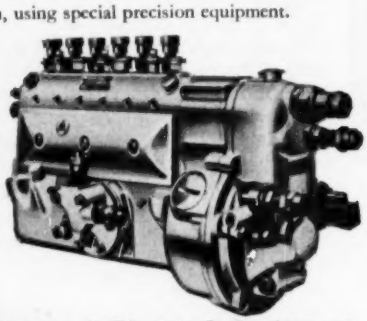
Transport operators all over the world have learnt to trust this sign.

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported — whether to Trondheim, Santiago, Hong-Kong or Sydney—there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



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Read Standard Catalog

A new 12 page, 2 color catalog on chemical processing equipment and Standardaire blowers has been recently issued by the Read Standard Corporation.

A number of pages, dealing with the axial flow positive pressure blowers, are well illustrated with photographs and charts. Complete specifications are given.

Driveshaft Bulletin

A new bulletin on Morflex radial and universal driveshafts is available from Morse Chain Company.

The bulletin gives complete data and specifications on radial driveshafts with spline-jointed tubular shafts, universal driveshafts with one-piece tubular shafts, and universal driveshafts with spline-jointed tubular shafts. It also provides a working table of maximum recommended lengths and speeds.

Nickel Booklet

A new technical booklet on the fabrication and design of nickel and high nickel alloy pipe and tubing has been issued by the Development and Research Division of The International Nickel Company, Inc.

Designated as Technical Bulletin T-17, it contains 27 pages illustrated throughout by drawings and photographs. It also presents tables on mechanical and physical properties, ASME code requirements, recommended welding procedures and other information.

Totally-Enclosed Motor Bulletin

Allis-Chalmers has recently released a bulletin describing their totally-enclosed motors with air-to-water heat exchangers. Properly fitted enclosures are said to keep out dust, dirt, fumes and excess moisture.

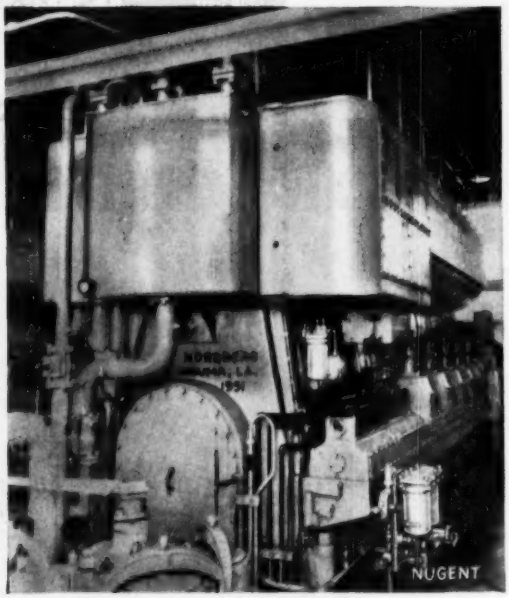
The bulletin includes a description of the three types of cooler arrangement-foundation, side or top-mounting—built into the motors and explains how to estimate their water requirements.

New Welding Alloys Chart

A new chart of low temperature welding alloys, measuring 10 by 14 in., suitable for wall hanging or for purchasing department files, has been issued by Eutectic Welding Alloys Corporation. It contains detailed specifications on close to 200 metal-joining alloys including bonding temperatures, tensile strengths, recommended uses, etc.

Major listings show proper welding alloys for use with cast iron, steel, stainless steels, copper, brass, bronze, nickel and nickel alloys, aluminum and aluminum alloys, magnesium alloys and zinc die castings as well as for hard overlaying, cutting, chamfering, piercing, gouging and joint preparation of all metals. Further sub-division of the information covers the use of the alloys with various heating methods, i.e., torch arc, and inert gas-shielded arc welding.

. Down in the bayous NUGENT FILTERS help guard Houma's power supply



Above — Nugent filters of the type used for actuator oil at Houma. *Right* — Fuel filter of the type used for pilot diesel fuel.

DEEP in Louisiana's beautiful bayou country, the City of Houma has recently passed the second anniversary of its diesel power plant . . . and, as is true in so many installations where dependability and continuity of service is important, Nugent Filters are used to help protect the engines. The engines are three 2000 H.P. Nordberg gas burning diesels . . . the Nugent filters are used to remove impurities from pilot fuel oil and actuator oil.

Wherever engines must give long dependable service, Nugent filtering is a must. Offering more effective filtering at lower cost, Nugent Filters are available in a complete range of sizes and types to meet every filtering need. Write for full data, outlining your filtering requirements.

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OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

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Drop Table Catalog

Whiting Corporation, manufacturer of drop tables, jacks and heavy duty accessories for railroad shops, announced recently the publication of a new 24-page, fully illustrated catalog on drop tables. Particular emphasis is paid to diesel shop installation.

A number of drawings supplement the installation views and show a variety of possible, efficient combinations of body supports and different types of tables.

Baker Bulletin

Hydraulic and cable-controlled earth-moving equipment manufactured by The Baker Manufacturing Company to match Allis-Chalmers crawler tractors is described in a recently released bulletin.

Baker attachments designed to work with A-C tractors described in the bulletin include the engine-mounted hydraulic control bulldozers, gradebuilders and root rippers for HD 5, 9, 15 and 20, and the three cable control units for the HD 9, 15 and 20.

Specifications are listed showing the moldboard height and width, height of lift, depth of cut, degree of tilt, weight of blade and mounting, and over-all length of tractor and blade, for all models.

NBS Annual Report

Summarizing the scientific investigations conducted by the National Bureau of Standards during the fiscal year 1950, a 113-page illustrated booklet, recently published by the NBS, contains accounts of current activities as well as more detailed descriptions of especially important scientific developments.

The scope of research and development, both theoretical and practical, is indicated by the names of the 13 scientific and technical divisions: electronics, atomic radiation physics, chemistry, mechanics, organic and fibrous materials, metallurgy, applied mathematics, mineral products, building technology, heat and power, electricity and optics, metrology, and radio propagation.

Calibration Service Catalog

The Fischer & Porter Company has available a new catalog giving full details on a calibration service now offered to industry. The company's fluids engineering department has operated a hydraulics laboratory since the company's inception and in the course of determining the exact characteristics of innumerable types of fluids under widely varying conditions, various facilities have been developed that make this service possible.

Hydraulic Remote Control Bulletin

Their new line of hydraulic remote controls are described generally in a new bulletin recently released by Sperry Products, Inc. These controls are single tube, balanced, self controlled systems operating independently without outside sources of power.

The controls are now being used for manual or automatic control of many varied devices in the industrial, automotive, aviation, railroad and marine industries. Installations are made with the use of a single copper tube which is said to eliminate usual maintenance problems. They have a maximum rated capacity of 400-in. lbs. on the pressure stroke and 125 in. lbs. on the return stroke.

Leece-Neville Brochure

A new, 24-page, illustrated brochure on the company and its products has been published by the Leece-Neville Company. It outlines the part played by the firm in the field of electrical equipment for diesel, gas and gasoline engines for over 40 years. This is followed by pictorial sections on production, assembly, testing and engineering facilities.

The balance of the booklet shows typical equipment made by the company for buses, trucks, industrial engines, off-highway equipment, passenger cars, rail, marine and aircraft. Included are ac.-dc. alternator systems, generators, starting motors, hand and magnetic switches, and voltage regulators.

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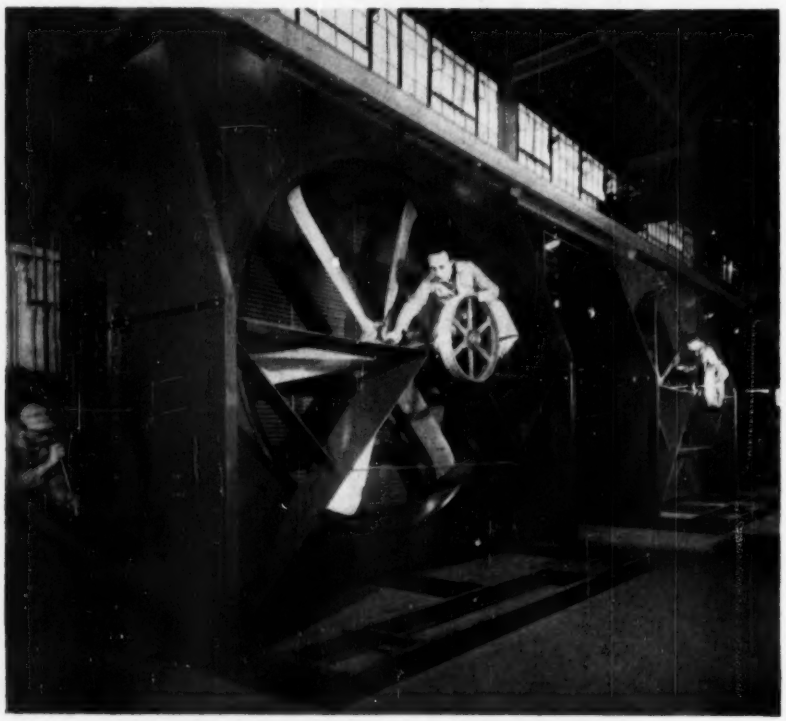
Field Notes



Diesel Engine Coolers Shipped to Liberia

The huge "fluid coolers" are the first of four units designed and fabricated by The Trane Company to air-cool jacket water and lube oil under tropical temperatures for the GM diesel power plants of Liberia Mining Company, Ltd., Monrovia, Liberia.

Each unit's 102-in. propeller fan will blow 80,000 cu. ft. of air per minute across six rows of extended surface heat exchanger cores to cool 300 gal. of water and 150 gal. of lubricating oil per minute. This company is also fabricating similar units of various sizes for U. S. Navy radio installations overseas, and for the giant Gulf Coast aluminum reduction plants of the Aluminum Company of America and Kaizer Aluminum & Chemical Corporation.

Diesel Engine Power Aiding Industry

Stewart & Stevenson Services, one of the nation's largest power distributors for the oil industry, now has the added distinction of "leading both leagues" in gas and diesel engine sales for the manufacturers they represent.

Dependable power is the heart of the oil industry and in diesel engine applications Stewart & Stevenson Services has made more General Motors Diesel Engine installations year after year than any other distributor in the nation, according to General Motors sales and production records.

The company is also in top place among distributors for Continental Motors gas and gasoline engines, according to sales records released earlier this year.

The organization has also made several outstanding contributions which have been valuable to both industry and national defense. One of these concerns extensive research into starting and operating diesel engines at temperatures as low as —65° F and as high as 125° F above zero.

Tools to Speed Government Contracts

As a part of the program to ease the machine tool shortage the Munitions Board has established a central inventory to record government-owned production equipment held by the Armed Forces. All three services will participate in operating the inventory. Each service will be able to search the entire catalog of Defense Department machine tools not in actual use. Any service requiring a machine tool to break a current bottleneck will be able to draw on the reserves of either of the other services to fill the need. C. E. MacArthur has been brought into the Munitions Board from the machine tool industry to take charge of the inventory.

The machine tool industry will have to add about 50 per cent more workers to meet its peak production goals under the current mobilization program. A report, "Manpower Requirements in the Machine Tool Industry in the Current Mobilization Program" is available from the Bureau of Labor Statistics, U. S. Department of Labor, Washington 25, D. C.

Arabian Oil Rated Safe for Present

Arabia, in which American oil interests are heavily invested, is in no immediate danger of succumbing to Russian domination, R. G. Follis, chairman of the board of Standard Oil Company of California, stated in a recent address.

Geographically, Arabia is farther removed from Russia than any other Near Eastern country, and there is virtually no opportunity for infiltration across the Arabian border from adjacent lands, Mr. Follis asserted. Arabia's nomadic people, living much as they have lived for hundreds of years and strongly influenced by the Moslem religion, offer poor prospects for Communist propagandists, he added.

"We take a philosophical view of

the danger of losing our investment in Arabia to Russia", Mr. Follis observed. "If there is a total war and we win, we will get our properties back. If Russia wins, it won't matter anyway".

He added that recent arrangements for a fifty-fifty profit split between the Arabian-American Oil Company and the Saudi Arabian Government had further improved already good relations between that government and the oil producers. Standard of California holds a 30 per cent interest in Aramco.

New Address for Tubing Appliance Co.

Tubing Appliance Company, Inc., well known tool manufacturers, recently announced that they have occupied new and enlarged quarters at 10321 Anza Avenue, Los Angeles 45, California.

Tinker Papers on Heat Transfer Selected for International Technical Conference

Three papers dealing with "Shell Side Characteristics of Shell and Tube

Heat Exchangers", written by Townsend Tinker, Buffalo, were preprinted for presentation and discussion at a conference of leading North American, English and European technical societies in London held recently.

Mr. Tinker's papers were selected on invitation of the Joint Committee on North American participation in the international discussion of outstanding developments in the various fields of heat transmission during the past decade.

More Power For PIE

Pacific Intermountain Express Company is adding more line-haul tractor power to its interstate operations, according to announcement made recently.

The company has received the first six units of a new fleet of GMC Model 671 dual-drive conventional type tractors. As fast as deliveries are made by GMC, the units are going through the general shops at Denver for modification to PIE's specifications and will immediately be put in service on the Denver-Kansas City Division.

With the acquisition of the new tractor equipment now on order the over-the-road tractor fleet will total 257 units. In addition to the GMC tractors, 20 new Peterbilt "Dromedary" type tractors will be delivered before January 1, 1952. The latter will go in service on company routes west of Denver. The new GMC and Peterbilt tractor equipment will repre-

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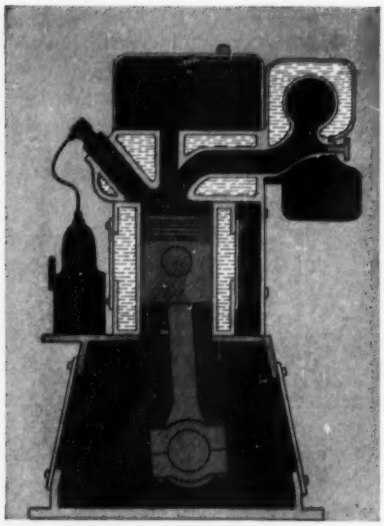

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SPECIALIZED INDUSTRIAL CLEANING
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sent an investment in excess of $750,000.

Lima Makes Last Locomotive

Baldwin-Lima-Hamilton Corporation turned out its last railroad locomotive at Lima, Ohio, closing a seventy-one year phase in that city's industrial life.

Now the firm will concentrate on production of power shovels and cranes and a line of stone crushers, road-building machinery and draglines.

The locomotive construction began in 1880, when the first engine was built at the old Lima Machine Works. Since that time company records show that 7823 locomotives were produced.

Ohio Crankshaft Expansion

A modern plant covering approximately two acres is under way for Ohio Crankshaft's rapidly expanding Tocco Division. The new building, 300 ft. by 240 ft., is planned for occupancy not later than June 1, 1952.

The purpose of the new plant is two-fold—first to consolidate and increase the facilities of the company's Tocco Division which manufactures high-frequency heat-treating equipment for industry; second to permit expansion of the crankshaft and camshaft division into present plant areas now occupied by Tocco.

The new Tocco building will house the largest induction heating laboratories in the world. Part of the experimental space is to enlarge development work on current projects and the remainder will be used to develop completely new applications of a "military nature" which are still in the drawing board phase.

Crude Oil Prices

A movement has been started in a section of the oil industry to obtain an increase in price ceilings on crude oil. Recently at the annual convention of the Independent Petroleum Association of America held in Houston, Texas, a resolution was adopted to that effect. The resolution pointed out that the current national average price of $2.56 a bbl. for crude oil compares with $2.59 in 1948, and that the rise was needed to spur production. With

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Bronze, Steel, Stainless Steel, Monel — ⅛"—36" I.D. with fittings as needed.

Diesel Bulletins 1020 & 50A furnish complete information.

See our Catalogs in Sweet's Files for Product Designers and Mechanical Industries.

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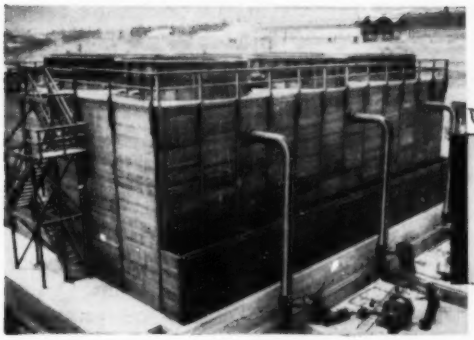

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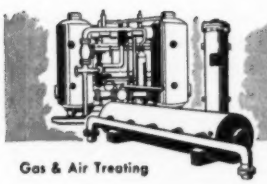
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the industry expanding drilling operations to the extent permitted by limited steel supplies, an increase in the price of crude oil probably would have little, if any influence in raising production. Too, the industry does not need a price rise to improve its earnings position. Generally, net earnings of the major companies are ahead of last year's after giving effect to the recent Federal tax measure.

Parts and Service Building for Mack

Mack Truck Corporation recently dedicated their new Service Parts Division building at Bridgewater Township, N. J. The new building, which is nine miles from Mack's nearest manufacturing plant and congested industrial and traffic areas, is an example of the modern concept of industrial dispersion in the atomic age.

One of the principal speakers at the dedicating ceremonies was Brigadier General William L. Barringer, Chief of Staff, First Army, who said in part: "Regardless of the reasons and costs, the advent of atomic explosives has brought home to us all, not the desirability but the absolute necessity of dispersion in industry if industry is to survive under atomic attack".

More Diesels for Rock Island

The Rock Island Lines announced recently that it had taken delivery on 12 diesel freight engines since October 1 and that on November 1, deliveries will start on 15 new suburban diesel engines, thus bringing closer the goal of full dieselization of the railroad by the end of next year.

Latest diesel acquisitions were general purpose models of 1500 horsepower. They will be used on various parts of the system for powering freight trains. Each one cost more than $143,000. They were made by the Electro-Motive Division of General Motors Corporation at the LaGrange, Illinois plant.

The suburban diesels will be of 1600-hp., manufactured by the American Locomotive Company. Their delivery will provide for virtually full dieselization of the Rock Island's suburban operations from Chicago.

Turbine Truck Successful

Boeing Airplane Company's program of testing its experimental gas turbine engine has been highly successful, a Boeing engineer said in Chicago recently in presenting a paper to the national transportation meeting of the Society of Automotive Engineers.

Henry C. Hill, assistant chief engineer of the Boeing gas turbine division, reported that success of the automotive portion of the program has been apparent in two ways:

With the gas turbine-powered Kenworth truck—first of its kind in the world—having undergone more than a year of road tests, a number of operational characteristics and some mechanical "bugs" in the 175-hp., 200-lb. engine not apparent from laboratory tests were brought to light. As a result, development of the engine has been accelerated.

Secondly, the road testing has focused attention on the proposition that the gas turbine does appear to be well

adapted to the duty required in a heavy road vehicle.

The engine has also been installed in a Navy personnel boat for propulsion tests, and a number are being produced under a Bureau of Ships contract to operate electric generators on Navy minesweepers. The Navy has also announced that one of the engines will be tested in a helicopter.

Tests have shown that lubricating oil consumption will be a negligible factor in gas turbine operation, it was claimed, but the test truck averaged only a little better than one mpg. on diesel fuel, compared to three, four or five mpg. for conventional truck engines.

However, if the truck chassis and engine installation were designed to take maximum advantage of the 2500- to 3000-lb. weight saving of the gas turbine and the payload increased, he said, the net return to the operator would be about the same for the turbine truck as for current diesel trucks.

In addition, Hill predicted a reduction of from 30 to 35 per cent in the fuel consumption rate, as a result of work on compressor and turbine design.

Diesel for Airport Fire Protection

With three independently operated pumping units on the job American Airlines headquarters at the Chicago Midway Airport has an ample water supply available for fire protection under almost any circumstances.

Two of the pumps are electrically driven and are set to start pumping when water pressure drops to 90 and 85 lbs. respectively. The third pump is a Dayton-Dowd centrifugal unit driven by a General Motors 6-cyl. diesel engine.

This unit is regarded as an emergency unit as it goes into action only in the event electricity fails to reach the No. 1 and No. 2 pump motors and/or the water pressure drops to 80 lbs.

NEW! Rochester TELLITE

Low Air Brake Pressure

High Water or Oil Temperature

Low Oil Pressure

Generator

VISUAL
WARNING SYSTEM
for Gas and Diesel Engines

This unique signal system gives a virtually foolproof warning whenever there's engine trouble . . . low oil or air brake pressure, high water or oil temperature, or generator failure. And it points out the trouble before expensive damage is caused.

Under normal conditions, a pilot light glows steadily. But when something goes wrong, it flashes brilliantly. It even indicates when the system itself is not operating. TELLITE is available with one flasher, or individual flashers connected to each point of contact to tell just where the trouble is.

This inexpensive trouble shooter is ideal for trucks, buses, tractors and industrial engines. Write for complete information. ROCHESTER MANUFACTURING CO., INC., 34 Rockwood St., Rochester 10, N.Y.

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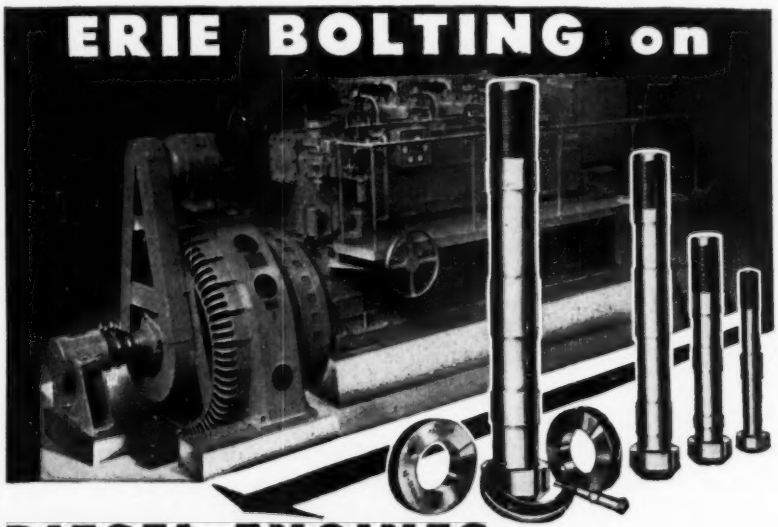
DIAL THERMOMETERS • GAUGES • AMMETERS

ERIE BOLTING on



DIESEL ENGINES

For over 30 years ERIE has manufactured bolts and studs to the specifications of Diesel Engine builders. This specialized experience gained in working with leading Diesel designing engineers assures you of getting the exact materials and the precise tolerance in bolting desired for your Diesel. Send us your specifications for Diesel Connecting Rod Bolts, Cylinder Head Studs, and other special bolting. Write for new price and data book.

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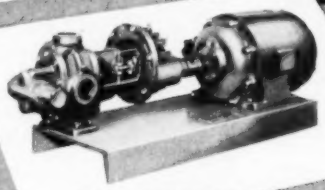

THE DEPENDABLE ROPER
FOR GENERAL PURPOSE PUMPING

Efficient, dependable pumps noted for endurance and high records of performance. They serve tank trucks, refineries, process plants and general industries — they will do an equally productive job for you. Series 3600 pumps feature hardened helical pumping gears, high-lead bronze bearings, split packing gland, adjustable relief valve. Standard or special fitted models; pressures to 60 P.S.I. — capacities 40 to 300 G.P.M.

Send for Booklet "HOW TO SOLVE PUMPING PROBLEMS"

ROPER Rotary Pumps

SEE OUR CATALOG IN SWEET'S

GEO. D. ROPER CORP.
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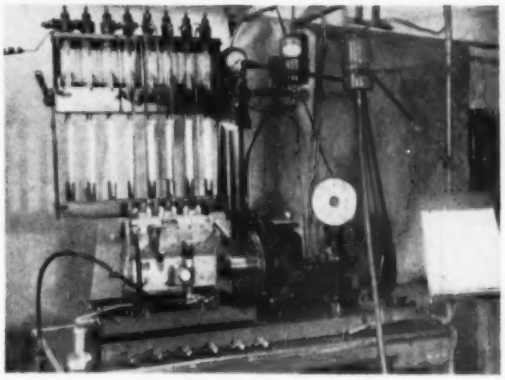
ROCKFORD, ILL.

DIESEL INJECTION SERVICE



AUTHORIZED SALES & SERVICE
AMERICAN BOSCH
BENDIX SCINTILLA

E. A. WILDERMUTH, Inc.
1102 ATLANTIC AVE., BKLYN, N. Y.
MA. 2-7700

LET US HELP YOU WITH YOUR DIESEL INJECTION PROBLEMS.

When these events occur the engine starts automatically and in seconds builds up to 1750 rpm. At that engine speed the pump is capable of delivering 2000 gpm. at 100 lbs. pressure.

This is sufficient to deliver water from Chicago's water mains to a sprinkler system protecting two airplane hangars and office space with a total of 150,000 sq. ft.

Salvaging Section Featured At Fleet Maintenance Show

A salvaging equipment section is to be a feature of the 1952 Transport Vehicle Show and Fleet Maintenance Exposition opening in New York the latter part of next February. Increasing shortages have led the sponsors of the show to give unusual attention to exhibits which demonstrate processes by which automotive materials may be restored to effective use after rejection.

A growing tendency to scrap accessories, component parts and fittings without consideration of possible reconditioning has run head-on into the current period of scarcity, according to H. Franklin Turner who heads the show organization.

The Materials Handling Committee is also formulating a program of dynamic demonstrations of labor and time saving handling equipment which is designed to form a lively feature of the show.

Link-Belt Opens Salt Lake City Branch

Link-Belt Company announces that it has opened a new Factory Branch Store at Salt Lake City, Utah in order to better serve the mines, mills and factories in Utah, southern Idaho and eastern Nevada with their power transmission and materials handling machinery requirements.

The new store and sales office is headed by Donald W. Newsome, district manager, an engineer transferred from the Company's San Francisco plant. He will be assisted by Harry Hotchkiss who until recently was on the staff of the Link-Belt store and warehouse in Spokane, Washington.

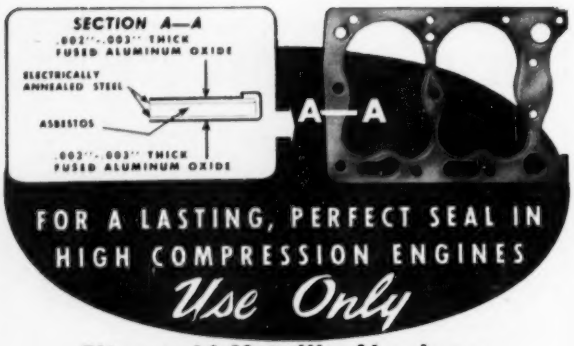
Radio WJR Installs Diesel Standby

Engineers of radio station WJR in Detroit saved a considerable amount of money recently when they installed a diesel generator set in the station's garage, thus eliminating the need for a new building.

The unit installed was a GM twin six diesel driving a 200 kw. generator. Since the garage was only 50 ft. from the station it provided an ideal location. It did, however, introduce the problem of vibration, which was successfully solved by mounting the unit on rubber mountings.

3M Forms New Company

Minnesota Mining and Manufacturing Company, makers of automotive and many other products, recently announced the formation of an international company and predicted that its foreign sales in 1952 would exceed $30 million.



FOR A LASTING, PERFECT SEAL IN HIGH COMPRESSION ENGINES

Use Only

Fitzgerald Metallic Aluminum-Fused-Oxide Steel Asbestos Gaskets*

Grease Retainers — Cork Gaskets

FITZ-Rite* Treated Fiber Gaskets for oil, gasoline and water connections. Complete Sets For Motor Rebuilders. *S. M. Reg. Pending

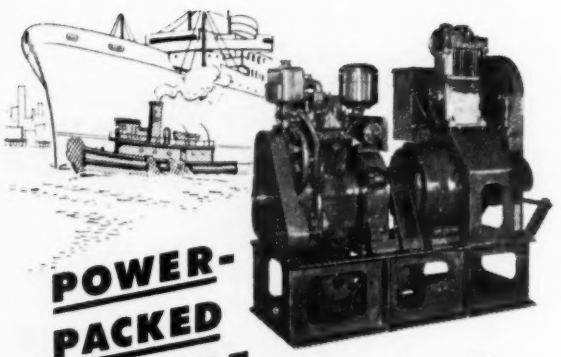
FITZGERALD *Gaskets*

SINCE 1906

The Fitzgerald Manufacturing Company

TORRINGTON, CONNECTICUT

There's a Fitzgerald Gasket for every Engine



POWER-PACKED PACKAGE ...by Reiner

ESTABLISHED 1927

• You'll find Reiner units like this combination diesel-driven generator, compressor and pump serving on many marine service boats. They meet the standards for compactness, dependability and efficiency this duty calls for with flying colors. Whatever your auxiliary power needs may be — wherever you need them — look to Reiner for the answer..

JOHN Reiner & COMPANY ESTABLISHED 1927

FREE BULLETINS *on standard units sent on request. Write today, stating your requirements.*

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LONG ISLAND CITY 1, N. Y.
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The new firm, a wholly-owned subsidiary, is Minnesota Mining and Manufacturing International Company, headed by R. W. Young, President. 3M International plans to develop production and sales organizations for the complete line of products in as many countries as possible.

Book Review

Fuel Oil Manual—by Paul F. Schmidt 160 pages, $3.50, The Industrial Press.

Fuel Oil Manual is intended for those who buy, use or sell fuel oil for building heating, power generation, marine applications, or industrial processes. Written by a chemist with many years experience in the industry, it provides a working knowledge of fuel oil and how to use it. Theory and involved discussions of interest only to chemists or refiners are avoided, technical language is used as little as possible, and all terms are fully explained. A chapter is devoted to each of the various important properties of fuel oil. In each case the author explains fully the meaning of each property, and shows how the information can be applied in selecting, handling or burning fuel oil. Fuel oil impurities and how they affect combustion are described fully, and the steps which can be taken to test for or avoid impurities are discussed.

This manual provides a thorough knowledge of the properties of fuel oil, of the possibilities and limitations of each grade, of the methods which can be used to assure uniform quality and efficient combustion, or how to diagnose fuel oil troubles and remedy them, and how to get maximum value from every fuel oil dollar.

Organizational News

Sealed Power Retirement

J. Howard Ballard has retired as chief engineer of Sealed Power Corporation and Edwin C. Beck has been promoted to this position.

Mr. Ballard has been associated with the corporation since 1929, and has been chief engineer for the past fifteen years. He has been granted numerous patents on piston rings and other automotive products.

Mr. Beck, a graduate of Massachusetts Institute of Technology, joined the corporation in 1937 as a sales engineer. He was last manager of the Detroit office contacting original equipment customers.

Link Belt Engineers

Link-Belt Company announced recently the appointment of Bert L. Pearce as chief engineer of the Ewart plant in Indianapolis to succeed Charles R. Weiss, who has retired after 42 years' service. Russell T. Sweeney has been appointed assistant chief engineer.

Mr. Pearce, a mechanical engineering graduate from Rose Polytechnic Institute, entered the employ of the order department of the company's Dodge plant in 1936. He has since held various important positions in engineering and sales at both Dodge and Ewart plants, and for the last

ten months has been assistant chief engineer for product design.

Mr. Sweeney started with the company at the Dodge plant in 1918 as a tool designer, later becoming chief draftsman. He was last assistant chief engineer for application engineering.

Cooper-Bessemer Addition

The appointment of Edward D. Van Fossen to Cooper-Bessemer's regional field office in Seattle has been announced recently. He will devote attention to the needs of gas, gas-diesel and diesel engines, engine driven compressors and liquid pumps in use on marine, industrial, chemical, petroleum processing and gas transmission applications.

A Navy pilot during World War II, Mr. Van Fossen graduated in mechanical engineering from the University of Washington and has been associated with the corporation for the past three years at their main plant in Mount Vernon, Ohio.

PIE Promotion

A. L. Springer, former fleet maintenance superintendent for PIE, has been promoted to the newly created post of director—transportation and

properties. He will be in charge of all line-haul transportation operations and equipment and will be responsible for supervision and maintenance of all terminal facilities, road equipment, and local pick-up and delivery fleet units. His headquarters will be in the general offices in Oakland, California.

Mr. Springer joined PIE three years ago and has had an active part in setting up the general shops in Denver and in inaugurating its preventive maintenance program. Prior to joining the company, he was employed in the operations department of Boeing Aircraft Company.

American Brake Shoe Superintendents

Edward J. Roesch has been appointed superintendent of the Meadow Lands, Pa., plant of the Brake Shoe & Castings Division, American Brake Shoe Company, and Thomas P. Wallace has been appointed superintendent of the Division's Buffalo plant.

Mr. Roesch, who was formerly superintendent of the Buffalo plant, started with the company in 1917 at the Buffalo plant, and became superintendent in 1936.

Mr. Wallace was formerly foundry foreman at the Division's Norwood, Mass. plant. Thomas Baldwin, formerly superintendent of the Meadow Lands plant, has retired, but will remain on a consulting basis for the next few months.

TAC does what no other tool can do!
AT LAST! AN OPEN-END RATCHET WRENCH — the world's first true universal wrench. A patented design for connections on tubing, rods, piping, conduit, studs, etc. Sixty-four socket sizes from ⅜" to 4". Smallest effective ratcheting arc yet — 5° to 7½°. TAC will also do every job any ordinary ratchet wrench will do: one TAC set replaces literally dozens of single-purpose hand tools.
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If you have a PUMPING PROBLEM
. . . ask for
VIKING PUMP ENGINEERING
You'll find Viking engineers don't need to compromise on size or style of Rotary pump to fit your needs. Probably there is one ready to adapt to your problem. They have a wealth of experience to draw from to help solve your pumping problems. Forty years of building, designing and applying Viking's gear-within-a-gear principle has developed the most complete line of all rotary pumps and it places them in a position to solve your pumping problem best.
Ask Viking for the answer to your pumping needs. Send for free bulletin 51SD today.
VIKING
AN HONORED NAME IN PUMPING
See Our Catalog in SWEETS
Viking PUMP COMPANY
Cedar Falls, Iowa

Borg-Warner Appoints

R. F. Schutz has been named assistant treasurer of the Ingersoll Products Division of Borg-Warner Corporation.

Schutz joined Ingersoll in 1944 as controller in the division's Kalamazoo, Michigan plant. He has also been in charge of contract sales, and for a time served as production manager.

Ashland Oil Executive

Appointment of Y. A. Koskinen to an executive advertising and sales post with Ashland Oil & Refining Company, Ashland, Ky. and five affiliated oil companies was announced recently. He will make his headquarters in Ashland, and coordinate all sales and advertising activities.

Koskinen has specialized in advertising in the petroleum field. He has been with Socony-Vacuum Oil Company and was advertising manager of National Petroleum News. He was last vice president of Richard T. Brandt, Inc. agency in Cleveland.

Obituary

"Cat" Founder Dies

C. L. Best, pioneer inventor and tractor builder, died recently in San Francisco at the age of 73. One of the

founders of Caterpillar Tractor Company, he was chairman of the board and member of the executive committee at the time of his death.

In 1910 he formed the C. L. Best Tractor Company at Elmhurst, California and began making gasoline wheel tractors. In 1913 his company entered the field of gasoline powered track-type tractors.

Best continued as president of his firm until 1925 when it and the Holt Manufacturing Company were merged to form Caterpillar Tractor Company. Best became chairman of the board of the new organization.

In the 1920's he strongly advocated the adoption of the diesel engine as track-type tractor power. Today, Caterpillar uses this prime mover exclusively to power its wide range of machines.

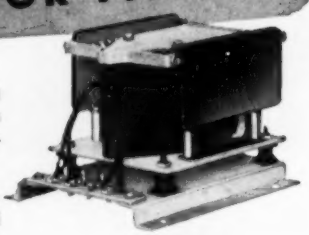
Sperry Gyroscope Appoints

A. R. Weckel has been named to the new position of general sales manager of Sperry Gyroscope Company Division of The Sperry Corporation, it was announced recently. For the time being he will also continue as director of commercial sales.

Mr. Weckel has been with the company since 1934, serving in various positions including those of assistant to the vice president and general sales manager, manager of field service and aeronautical sales manager.

Burlington

GENERATOR VOLTAGE REGULATOR TYPE WA



Designed for use in regulating the voltage of A.C. generators in Stationary, Mobile or Marine installations.

Direct rheostatic action provides a simple, effective and automatic means of regulating voltage by preforming the function of an automatic field rheostat.

Rating of rheostatic element is 2 amperes maximum exciter shunt field current at full load and power factor. Maximum sigma watts is 50 watts.

FEATURES

- Direct Acting
- Fast Response
- Automatic Control
- Small, Compact, Self Contained
- Rugged Construction
- Rheostatic Action
- Inexpensive

Inquiries for complete information and engineering services solicited.

BURLINGTON INSTRUMENT CO.
DEPT. B-111
BURLINGTON, IOWA

STATEMENT OF THE OWNERSHIP, MANAGEMENT AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (Title 39, United States Code, Section 233)

State of New York
County of New York ss.

Of DIESEL POWER & DIESEL TRANSPORTATION published monthly at Orange, Connecticut, for October 15, 1951.

1. The names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, Diesel Publications, Inc., 192 Lexington Ave., New York 16, N. Y. Editor, Brian P. Emerson, 192 Lexington Ave., New York 16, N. Y. Managing editor, None. Business manager, A. N. Goding, 192 Lexington Ave., New York 16, N. Y.

2. The owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual member, must be given.)

Diesel Publications, Inc., 192 Lexington Ave., New York 16, N. Y.; Jessie W. Rosencrans, Mamaroneck, New York; Dorothy R. Brighton, Mamaroneck, New York; George R. Brighton, Mamaroneck, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1 percent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.)
None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

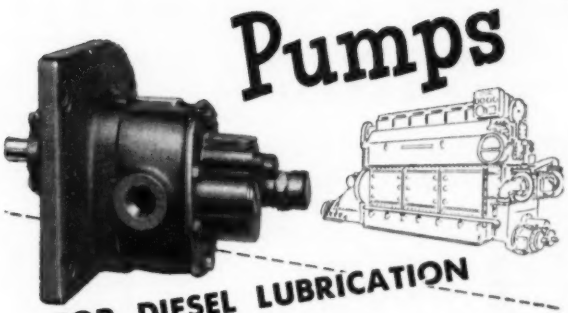
5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: (This information is required from daily, weekly, semiweekly, and triweekly newspapers only.)

DIESEL PUBLICATIONS, INC.
GEORGE R. BRIGHTON, Pres.

(Signature of editor, publisher, business manager, or owner)
Sworn to and subscribed before me this 17th day of September, 1951,

MORRIS J. RUBIN,
Notary Public in the State of New York,
Residing in Kings County,
Kings County Clk's No. 31-3389950,
Certificate filed in New York County
(My commission expires March 30, 1953.)

(SEAL)



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FOR DIESEL LUBRICATION

THE rotary geared pump shown above is particularly suited for diesel lubrication systems. It has a special flange mounting to facilitate installation together with provision for tachometer drive.

Thousands of Brown & Sharpe Pumps are now providing trouble-free service for transfer, lubrication and booster systems. Get acquainted with their reliability and economy. Write for Catalog. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

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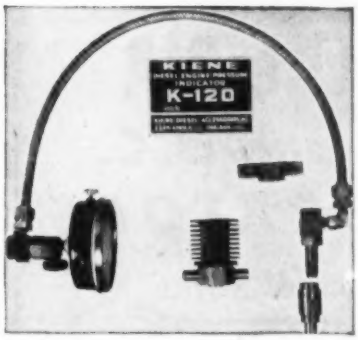
KIENE MODEL K-120 UNIVERSAL PEAK PRESSURE INDICATOR



Model K-120 with cooler body and nozzle dummy.

MODEL K-120 Indicator has but one moving-part—nothing to wear or get out of adjustment.

VALVE—Gas trap type with diaphragm type check valve having adjustable lift. Stainless steel valve and seat.

No springs—No pistons—no complicated adjustments — No temperature corrections — no pressure loss in check valve.

GAGE READS TRUE PRESSURE—MAY BE RECALIBRATED ON ANY GAGE TESTER

Check readings can be made over and over again by releasing indicated pressures with bleeder valve.

GAGE—Hydraulic 3½ inch dead weight tested in suitable range to specification requirements.

ADAPTORS available for most models of engines manufactured in U.S.A. Other models made to order at reasonable prices.

For

Testing Firing and Compression Pressures on all Models of Diesel and Gas Engines.

Dependable — Easy to Use — Rugged. May be Used With or Without Flexible Tube.

DESCRIPTIVE BULLETINS AND PRICES FURNISHED ON REQUEST

Manufactured under patents No. 2280411, No. 2328328, others pending

KIENE DIESEL ACCESSORIES, INC.
10352 PACIFIC AVE., FRANKLIN PARK, ILLINOIS

Bridgeport Chain Addition

Russell P. Sherrill has recently joined The Bridgeport Chain & Manufacturing Company as New England district sales manager.

Sherrill, who attended Williams College, was formerly associated with the Hoist Division of Yale & Towne Manufacturing Company as New England district sales representative.

Allis-Chalmers Changes

R. M. Casper has been named manager of the new Allis-Chalmers power department, formed by a merger of the electrical and mechanical power departments. Casper has been manager of the electrical department since 1949.

Tom W. Metz has been appointed manager of the Indianapolis district of Allis-Chalmers general machinery division. He has been a sales representative in the Dallas office since 1941.

Worthington Executives

W. R. Leopold, assistant to the vice president, has recently been appointed to direct the operations of the Public Works Division of Worthington Pump and Machinery Corporation. D. L. Gallagher has been appointed manager of the division.

Mr. Leopold, right, started with Worthington in 1917 as a sales trainee in the meter shop in Harrison and was advanced successively until last year he was appointed assistant to vice president Cruthers.

Mr. Gallagher, left, joined the corporation after seven years with the New York Power and Light Corporation. Since 1950 he has been assistant manager of the Public Works Division.

SKF Vice Presidents

R. Robert Zisette, Gunnar Palmgren, Eric C. Brodin and Karl Kesselring have been elected vice presidents of SKF Industries, Inc. All will have their headquarters at the Philadelphia plant.

Zisette is in charge of sales, advertising and market research; Brodin, manufacturing development; Palmgren, engineering and research, and Kesselring, production.

Round Chain Vice President

Election of John F. Ansink as vice president of the Round Chain & Manufacturing Company has been announced recently.

Ansink has been general manager of the Round Chain & Manufacturing Company since its formation two years ago and will continue in that capacity. Previously he had been Chicago district manager of The Cleveland Chain & Manufacturing Company.

Specify

COLUMBIA

A. C. and D. C.

GENERATORS

- For Coupled Service
- For Belt Drive
- Single or Two Bearing

Columbia, with its years of experience, brings to generator set assemblers a wide line of performance proved, sturdily built, A. C. and D. C. Generators.

AC Generators: 6¼ to 1000 KVA
DC Generators and Exciters: 2 to 300 KW

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Write for information. Our Engineers will be glad to review your requirements.

COLUMBIA ELECTRIC MFG. CO.
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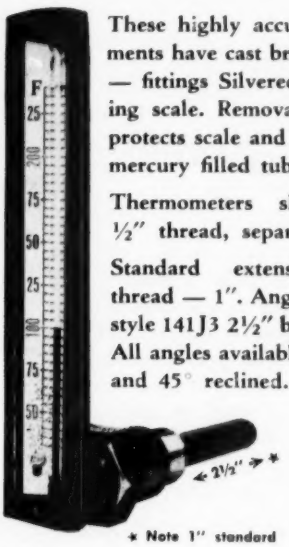
DPS CO. THERMOMETERS

Submarine Style

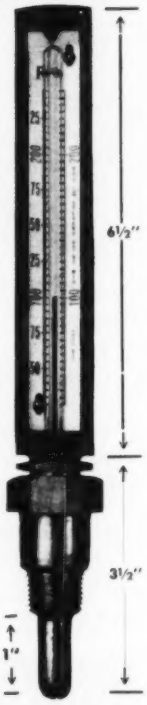
Meeting Navy Specifications



These highly accurate instruments have cast bronze V case — fittings Silvered easy reading scale. Removable window protects scale and red reading mercury filled tube.

Thermometers shown have ½" thread, separable socket.

Standard extension below thread — 1". Angle cut shows style 141J3 2½" below thread. All angles available left, right, and 45° reclined.



* Note 1" standard

Angle type 41J3 $10.50 each

Straight type 40J1 $9.85 each

DIESEL PLANT SPECIALTIES CO.
STEVENS POINT, WISCONSIN

Cleveland Diesel Promotes

Tom E. Hughes was recently named assistant general manager and Roger D. Williams was named general sales manager of the Cleveland Diesel Engine Division of General Motors Corporation.

Hughes, left, joined GM in 1933 as a helper in the test department. He has been manager of the Washington branch of the Cleveland Division and general sales manager in Cleveland.

Williams, right, joined the Division in 1941 in the test department. He was last with the sales department in charge of industrial sales.

Willard Promotion

Jay H. Hudson has been named as assistant to the executive vice president of Willard Storage Battery Company.

A graduate of Case Institute of Technology and Western Reserve Law School, Mr. Hudson was formerly in

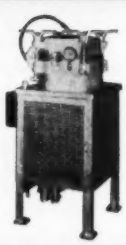
HILCO LUBE AND FUEL OIL PURIFICATION FOR DIESEL AND GAS ENGINES . . .

PURIFIERS · FILTERS · RECLAIMERS · CONDITIONERS

THERE'S A HILCO FOR EVERY LUBRICATION AND FUEL OIL FILTERING PROBLEM . . .

YOU WANT CLEAN OIL AND CLEAN ENGINES TO SAVE EQUIPMENT - OIL AND MONEY - INVESTIGATE HILCO OIL MAINTENANCE METHODS

★ *WRITE FOR FREE LITERATURE - NO OBLIGATION*



• THE HILLIARD CORPORATION, 120 W. FOURTH ST., ELMIRA, N. Y. •

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"AMOT" THERMOSTAT

Complete line available from ½" pipe size to 6" pipe size

Automatic temperature control for jacket water or lube oil for engines and compressors from 3 hp to 5000 hp.

"Amot" thermostats will give your engines many years of dependable operation without any servicing or adjusting. Very reliable under conditions of extreme vibration.

Used for automatic temperature control on pipe line engines, electric power plants, marine engines, drag lines, and on all other engine applications.

Compare features and prices. Write for catalog on "Amot" thermostats.

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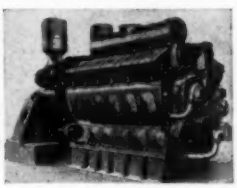

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Mr. Nordberg graduated from Marquette University as a mechanical engineer in 1944 and after two years of naval service was discharged in 1946. In that year he joined the company as a test and erection engineer in the heavy machinery division. He was later transferred to engineering installation, a position retained until his recent appointment.

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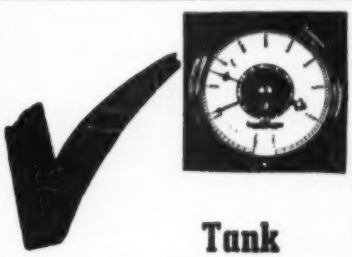

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The Chisholm Trail opened the way to cash markets for Texas longhorn cattle. Until then, they had been accumulating on the range and were practically worthless.

So are your worn out Diesel liners and crankshafts. But they needn't be! Just take the "For Scrap Only" tags off them and send them to us.

Our VANDERLOY M process restores their bearing surfaces to original dimensions. With addition of PORUS-KROME* they'll wear as much as four times longer than they did without this protection. Yet the cost for BOTH processes is less than the price of new parts.

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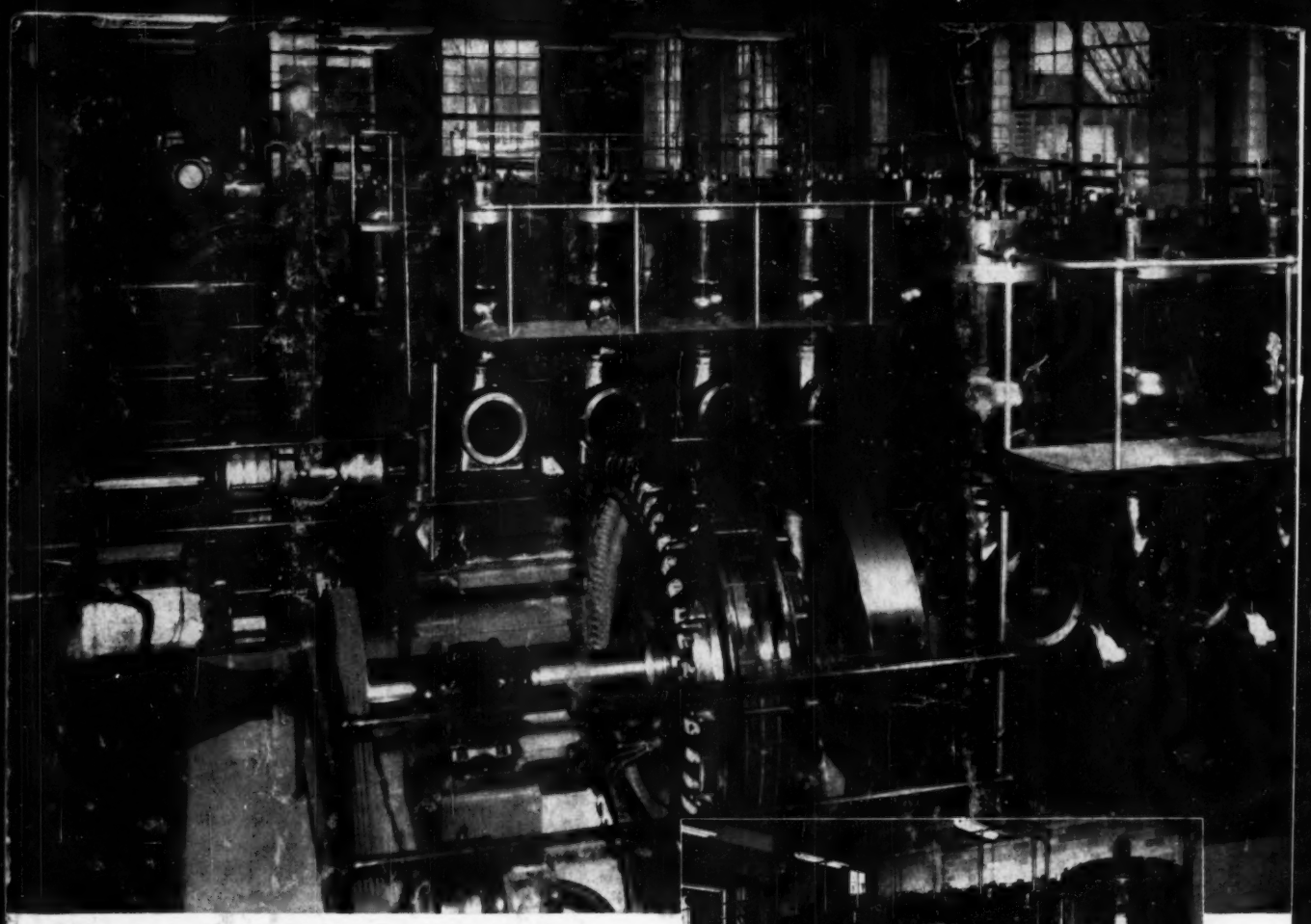

Above: Interior view of Municipal Light Plant, Madelia, Minnesota.

Right: T. C. Splinter, Superintendent (at right), checks performance of big diesel while S. C. Field of Standard Oil's Mankato office looks on.

Ailing diesels get clean bill of health

As power demands grew, so did trouble for the Municipal Light Plant of Madelia, Minnesota. Carbon formed rapidly in the plant's three diesel engines. Ports required cleaning every two to three weeks. Diesels had to be shut down frequently to free stuck rings and remove varnish from cylinder walls.

T. C. Splinter, plant superintendent, put the problem to a Standard Oil lubrication specialist. The lubrication specialist pointed out that the straight mineral oil used in the engines was not able to stand up under the severe conditions of operation. He recommended a switch to STANDARD HD Diesel Oil.

This heavy-duty lubricant made a clean sweep of the troubles. In four years of hard service, STANDARD HD has kept engines clean and rings free. Port carbon has been reduced to a minimum. Engines are now operated up to 8,800 hours before they are inspected or cleaned. Maintenance costs have been trimmed 30% to 40%.

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TRADE MARK
Diesel Oil

A 1400-hp diesel engine was added to the plant in 1948. This makes a total of 2,840 diesel horsepower now protected by STANDARD HD for this plant.

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